UNIVERSITY OF INFORMATION SCIENCES AND TECHNOLOGIES "SAINT PAUL THE APOSTLE" IN OHRID

Faculty of Information and Communication Sciences

бр. _____
Охрид,_____20__год.

E L A B O R A T

FOR RE-ACCREDITATION AND DENOMINATION OF STUDY PROGRAM

Digital Business Analytics
First Cycle of Studies
Four-Year Studies

PROPOSING INSTITUTION:
UNIVERSITY OF INFORMATION SCIENCES AND TECHNOLOGIES "SAINT PAUL THE APOSTLE" IN OHRID
Faculty of Information and Communication Sciences

Ohrid, 2023

STUDY PROGRAM STRUCTURE

Table 6.1. Course schedule by semesters and years of study for academic studies (AS)

No.	Course code	Course title	Semester	Weekly teaching load		EKTC
				L	T	
FIRST YEAR						
1	ICS11M01	Economics I	I (first)	3	2	6 (six)
2	ICS11M02	Information and Communication Technologies I	I (first)	3	2	6 (six)
3	ICS11M03	Introduction to Programming I	I (first)	2	4	6 (six)
4	ICS11M04	Mathematics 1	I (first)	3	2	6 (six)
5	ICS11M05	English for Technical Communication 1	I (first)	3	2	6 (six)
6	ICS12M01	Object-Oriented Programming	II (second)	2	4	6 (six)
7	ICS12M02	Society and Technological Transformation	II (second)	3	2	6 (six)
8	ICS12M03	Economic Mathematics	II (second)	3	2	6 (six)
9	ICS12M04	English for Technical Communication 2	II (second)	3	2	6 (six)
10	ICS12EXX	Elective course*	II (second)	3	2	6 (six)
Total hours (lectures/exercises) and ECTS for the year:				28	24	60 (sixty)

* Course from the list of elective courses proposed by the unit (Table 4.2.1)

No.	Course code	Course title	Semester	Weekly teaching load		EKTC
				L	T	
SECOND YEAR						
11	ICS13M01	Economics of Electronic Commerce	III (third)	3	2	6 (six)
12	ICS13M02	Algorithms and Data Structures 1	III (third)	3	2	6 (six)
13	ICS13M03	Databases 1	III (third)	3	2	6 (six)
14	ICS13M04	Scripting Programming	III (third)	3	2	6 (six)
15	XXX13UXX	Elective course**	III (third)	3	2	6 (six)
16	ICS14M01	Web Application Development	IV (fourth)	3	2	6 (six)
17	ICS14M02	Business Law	IV (fourth)	3	2	6 (six)
18	ICS14M03	Software Engineering	IV (fourth)	3	2	6 (six)
19	ICS14EXX	Elective course*	IV (fourth)	3	2	6 (six)
20	XXX14UXX	Elective course**	IV (fourth)	3	2	6 (six)
Total hours (lectures/exercises) and ECTS for the year:				30	20	60 (sixty)

* Course from the list of elective courses proposed by the unit (Table 4.2.1)

** Course from the university list of elective courses (Table 4.2.2)

No.	Course code	Course title	Semester	Weekly teaching load		EKTC
				L	T	
THIRD YEAR						
21	ICS15M01	Business Information Systems	V (fifth)	3	2	6 (six)
22	ICS15M02	Probability and Statistics	V (fifth)	3	2	6 (six)
23	ICS15M03	Economic Analysis of Business and Financial Operations	V (fifth)	3	2	6 (six)
24	ICS15EXX	Elective course*	V (fifth)	3	2	6 (six)
25	XXX15UXX	Elective course**	V (fifth)	3	2	6 (six)
26	ICS16M01	Information Systems Management	VI (sixth)	3	2	6 (six)
27	ICS16M02	Decision Methods	VI (sixth)	3	2	6 (six)
28	ICS16M03	Data Visualization	VI (sixth)	3	2	6 (six)
29	ICS16EXX	Elective course*	VI (sixth)	3	2	6 (six)
30	XXX16UXX	Elective course**	VI (sixth)	3	2	6 (six)
Total hours (lectures/exercises) and ECTS for the year:				30	20	60 (sixty)

* Course from the list of elective courses proposed by the unit (Table 4.2.1)

** Course from the university list of elective courses (Table 4.2.2)

No.	Course code	Course title	Semester	Weekly teaching load		EKTC
				L	T	
FOURTH YEAR						
31	ICS17M01	ERP Systems Economics	VII (seventh)	3	2	6 (six)
32	ICS17M02	Artificial Intelligence	VII (seventh)	3	2	6 (six)
33	ICS17M03	Distributed Systems	VII (seventh)	3	2	6 (six)
34	ICS17EXX	Elective course*	VII (seventh)	3	2	6 (six)
35	ICS17EXX	Elective course*	VII (seventh)	3	2	6 (six)
36	ICS18M01	Business Intelligence and Analytics	VIII (eighth)	3	2	6 (six)
37	ICS18M02	Entrepreneurship	VIII (eighth)	3	2	6 (six)
38	ICS18M03	Graduation Thesis and Preparation	VIII (eighth)	3	2	6 (six)
39	ICS18M04	Digital Management	VIII (eighth)	3	2	6 (six)
40	ICS18EXX	Elective course*	VIII (eighth)	3	2	6 (six)
Total hours (lectures/exercises) and ECTS for the year:				30	20	60 (sixty)

* * Course from the list of elective courses proposed by the unit (Table 4.2.1)

Table 6.2. Elective courses in the study programme

Type of elective course	No
Elective courses from the list of professional elective courses proposed by the unit	7
Elective courses provided by the unit from the university list of elective courses	4

Table 6.2.1. List of elective courses proposed by the unit

No.	Course code	Course title	Semester	Weekly teaching load		EKTC	From which unit
				lectures	tutorials		
1	ICS12E01	Multimedia Data Processing	II (second)	3	2	6 (six)	*ФИКН*[3]
2	ICS12E02	Logic Circuits and Digital Electronics	II (second)	3	2	6 (six)	*ФИКН*[3]
3	ICS12E03	Signals and Systems	II (second)	3	2	6 (six)	*ФИКН*[3]
4	ICS12E04	Mathematics 2	II (second)	3	2	6 (six)	*ФИКН*[3]
5	ICS14E01	Network Technologies	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
6	ICS14E02	Graph Theory	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
7	ICS14E03	Economics of Business Processes and Transactions	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
8	ICS14E04		IV (fourth)				
9	ICS14E05	Algorithms and Data Structures 2	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
10	ICS14E06	Communication Theory	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
11	ICS14E07	Social Networks	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
12	ICS14E08	Political Processes and Governance in the 21st Century	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
13	ICS14E09	Legal Aspects of Computer Crime	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
14	ICS14E10	Introduction to Robotics	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
15	ICS15E01	Computer Organization and Architecture	V (fifth)	3	2	6 (six)	*ФИКН*[3]
16	ICS15E02	Computer Graphics	V (fifth)	3	2	6 (six)	*ФИКН*[3]
17	ICS15E03	Linear Algebra	V (fifth)	3	2	6 (six)	*ФИКН*[3]
18	ICS15E04	Computer Simulations in Physics	V (fifth)	3	2	6 (six)	*ФИКН*[3]
19	ICS15E05	Human-Computer Interaction	V (fifth)	3	2	6 (six)	*ФИКН*[3]
20	ICS15E06	Modeling and Simulations	V (fifth)	3	2	6 (six)	*ФИКН*[3]
21	ICS15E07	Digital Signal Processing	V (fifth)	3	2	6 (six)	*ФИКН*[3]
22	ICS15E08	Optical and Wired Networks	V (fifth)	3	2	6 (six)	*ФИКН*[3]
23	ICS15E09	Musical Programming	V (fifth)	3	2	6 (six)	*ФИКН*[3]
24	ICS15E10	Discrete Mathematics	V (fifth)	3	2	6 (six)	*ФИКН*[3]
25	ICS15E11	Control Theory	V (fifth)	3	2	6 (six)	*ФИКН*[3]
26	ICS15E12	Multimedia Information Systems	V (fifth)	3	2	6 (six)	*ФИКН*[3]
27		Economics of Digital Marketing	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
28	ICS16E01	Operating Systems	VI (sixth)	3	2	6 (six)	*ФИКН*[3]

29	ICS16E02	Information Theory	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
30	ICS16E03	User Interface Design	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
31	ICS16E04	Programmable Logic Controllers	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
32	ICS16E05	Numerical Methods	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
33	ICS16E06	Economics of Electronic Banking	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
34	ICS16E07	Internet Programming	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
35	ICS16E08	Microprocessors	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
36	ICS16E09	Wireless Networks	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
37	ICS16E10	Stochastic Processes	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
38	ICS16E11	Databases 2	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
39	ICS17E01	Digital Music	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
40	ICS17E02	Cryptography	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
41	ICS17E03	Internet of Things	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
42	ICS17E04	Digital Signal and Image Processing	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
43	ICS17E05	Optimization Methods	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
44	ICS17E06	Data Engineering	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
45	ICS17E07	Multiplatform Programming	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
46	ICS17E08	Music and Mathematics	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
47	ICS17E09	Wireless Mobile Systems	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
48	ICS17E10	Platform Engineering	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
49	ICS17E11	Cloud Data Processing	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
50	ICS17E12	Wireless Mobile Systems	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
51	ICS17E13	Machine Learning	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
52	ICS17E14	Legal Protection of Data	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
53	ICS17E15	Wireless Sensor Networks	VII (seventh)	3	2	6 (six)	*ФИКН*[3]
54	ICS18E01	Parallel Programming	VIII (eighth)	3	2	6 (six)	*ФИКН*[3]
55	ICS18E02	Blockchain Development	VIII (eighth)	3	2	6 (six)	*ФИКН*[3]
56	ICS18E03	Data Science	VIII (eighth)	3	2	6 (six)	*ФИКН*[3]
57	ICS18E04	Deep Learning	VIII (eighth)	3	2	6 (six)	*ФИКН*[3]
58	ICS18E05	Offensive Security	VIII (eighth)	3	2	6 (six)	*ФИКН*[3]
59	ICS18E06	Virtual and Augmented Reality	VIII (eighth)	3	2	6 (six)	*ФИКН*[3]
60	ICS18E07	Natural Language Processing	VIII (eighth)	3	2	6 (six)	*ФИКН*[3]

Table 6.2.2. University list of elective courses

No.	Course code	Course title	Semester	Weekly teaching load		EKTC	From which unit
				lectures	tutorials		
1	CNS13U01	Digital Art	III (third)	3	2	6 (six)	*ФКМБ*[1]
2	ICS13U01	Ethics of Electronic Literature	III (third)	3	2	6 (six)	*ФИКН*[1]

[1] Faculty of Computer Science and Engineering

3	ICS13U02	Creative Writing for Media	III (third)	3	2	6 (six)	*ФИКН*[3]
4	MIR13U02	Democracy and Technology	III (third)	3	2	6 (six)	*ФПИТМИР*[5]
5	MIR13U03	Open Data	III (third)	3	2	6 (six)	*ФПИТМИР*[5]
6	MIR13U01	Law in Information Technologies	III (third)	3	2	6 (six)	*ФПИТМИР*[5]
7	ISVMA13U01	English for Academic Purposes	III (third)	3	2	6 (six)	*ФИСВМА*[2]
8	CNS14U02	The Art of Graphic Design	IV (fourth)	3	2	6 (six)	*ФКМБ*[1]
9	CNS14U03	Visual Arts and 3D Modeling	IV (fourth)	3	2	6 (six)	*ФКМБ*[1]
10	ICS14U03	Theory of Culture	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
11	ICS14U04	Literary Theories in Journalism	IV (fourth)	3	2	6 (six)	*ФИКН*[3]
12	MIR14U04	Diplomacy in Modern Times	IV (fourth)	3	2	6 (six)	*ФПИТМИР*[5]
13	CNS15U05	2D and 3D Techniques for Concept Art	V (fifth)	3	2	6 (six)	*ФКМБ*[1]
14	CNS15U04	Introduction to New Media Art	V (fifth)	3	2	6 (six)	*ФКМБ*[1]
15	ICS15U05	Animation Storytelling	V (fifth)	3	2	6 (six)	*ФИКН*[3]
16	ICS15U06	Intertextuality and Hypertextuality in Game Theory	V (fifth)	3	2	6 (six)	*ФИКН*[3]
17	MIR15U06	Public Speaking	V (fifth)	3	2	6 (six)	*ФПИТМИР*[5]
18	MIR15U07	Elections, Electoral Systems and Technology	V (fifth)	3	2	6 (six)	*ФПИТМИР*[5]
19	MIR16U09	Negotiation and Conflict Resolution	VI (sixth)	3	2	6 (six)	*ФПИТМИР*[3]
20	CNS16U06	Visual Arts and 3D Character Animation	VI (sixth)	3	2	6 (six)	*ФКМБ*[1]
21	ICS16U07	Art and Creativity	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
22	ICS16U08	Creative Writing	VI (sixth)	3	2	6 (six)	*ФИКН*[3]
23	MIR16U08	Open Government	VI (sixth)	3	2	6 (six)	*ФПИТМИР*[5]
24	CNS16U08	Video Art and Production	VI (sixth)	3	2	6 (six)	*ФКМБ*[5]
25	ISVMA16U07	English for Specific Purposes	VI (sixth)	3	2	6 (six)	*ФИСВМА*[4]

Table 6.3. Overview of the representation of compulsory and elective courses in the study programme

Semester	No. of compulsory courses	No. of elective courses	Total courses
I	9	1	10
II	7	3	10
III	6	4	10
IV	7	3	10
Total	29	11	40
% representation	72,5%	27,5%	100%

Table 6.4. Overview of the percentage representation of compulsory and elective courses

No	Duration of studies (years)/ total number of ECTS of the study program	Total workload expressed in ECTS		Load for compulsory subjects expressed in ECTS		Load for elective subjects expressed in ECTS	
		А Total number of ECTS from subjects	А1 Percentage of ECTS from subjects of the study program	**Б** / Total number of ECTS from compulsory subjects B1	Б1 Percentage of ECTS from compulsory subjects in relation to the total number of ECTS of the study program	**В** Total number of ECTS from elective subjects	В1 Percentage of ECTS from elective subjects in relation to the total number of ECTS of the study program
1.	4 years / 240	**240**	**100%**	**174**	**(Б/А)*100=72,5 %**	**66**	**(В/А)*100=27,5 %**

[2] Faculty of Information Systems, Visualization, Multimedia and Animation

[3] Faculty of Applied Information Technologies, Machine Intelligence and Robotics

Course programs with information in accordance with Article 4 of the Rulebook on the mandatory components that the study programs of the second cycle of studies should possess ("Official Gazette of the Republic of Macedonia", No. 25/2011 and No. 154/2011)

First year / 1	**Subject program from the first , second and third cycle of studies**

1.	Title of the course	Economy				
2.	Code	ICS11M01				
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences				
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle				
6.	Academic year / semester	1st year/ 1st semester	7.	Number of ECTS credits	6	
8.	Teacher					
9.	Prerequisites for enrolling in the course	Basic knowledge of economics and mathematics				
10.	Objectives of the subject program (competencies): The program will enable students to gain knowledge and understanding of economic concepts and their application in the analysis of economic processes. Within the program, students will be able to understand the behavior of consumers and firms, analyze different market structures, analyze and solve various issues and problems in the economic environment. They will gain knowledge of how the economy functions at the macro level and will develop abilities to determine problems in the economy and identify possible policies, measures and instruments to overcome macroeconomic problems.					
11.	Course content: Introduction to Economics; Demand, Supply and Elasticity; Consumption Theory; Markets and Welfare; Firm Behavior (Costs and Production), Competitive Markets; Monopoly, Monopolistic Competition and Oligopoly; Factor Markets; Equality and Efficiency (Externalities, Public Goods and State Redistribution Policy). Measuring National Income; Measuring the Cost of Living; The Real Economy in the Long Run, Money and Prices in the Long Run; Basic Concepts of an Open Economy; Short-Run Economic Fluctuations; International Trade, International Institutions and Globalization.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours				

15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17.	Grading method 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Seminar paper/project (presentation: written and oral)	15 points
	17.3.	Activity and participation	5 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)

			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English , Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				
	22.1	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	Gregory Mankiew	Principles of Economics 9/ed	Cengage Learning	2020
		2.				
		3.				
	22.2	Additional literature			
		Serial number	A second	Title	Publisher	Year
		1.	Samuelson P. and Nordhaus W.	Economics 19th ed.	McGraw Hill International Edition	2010
		2.	Stephen Ison and Stuart Wall	Economics 4th ed.	Pearson Education Limited	2007
		3.				

First year / 2	**Subject program from the first , second and third cycle of studies**				
1.	Title of the course	Information and communication technologies			
2.	Code	ICS11M02			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	1st year/ 1st semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Atanas Hristov			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): Students should become familiar with the concepts characteristic of information technologies, recognize and differentiate them, understand the ways in which they function, the domains of use, as well as be able to choose the appropriate technology for use in given needs.				
11.	Course content: 1. Introduction and evolution of computer systems. 2. Elements on the system unit .				

	3. Input/output and data storage. 4. Management on files . 5. Systemic software . 6. Application software: productivity tools. Microsoft Office. 7. Introduction to computer networks: communicating and sharing. 8. The Internet and the World Wide Web. 9. Wired and wireless communications . 10. Advanced technologies . 11. Advanced application of computer systems.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours		
16.	Other forms of activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		
		16.3.	Home learning	35 hours		
17.	Grading method 80 + 15 + 5					
	17.1.	Tests		80 points		
	17.2.	Seminar paper/project (presentation: written and oral)		15 points		
	17.3.	Activity and participation		5 points		
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)		
			from 51 to 60 points	6 (six) (E)		
			from 61 to 70 points	7 (seven) (D)		
			from 71 to 80 points	8 (eight) (C)		
			from 81 to 90 points	9 (nine) (B)		
			from 91 to 100 points	10 (ten) (A)		
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction		English , Macedonian			
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures			
	Literature					
	22.1	Mandatory literature				
		Serial	A second	Title	Publisher	Year

		numbe r				
		1.	William Stallings	Computer Organization & Architecture	Prentice Hall	2019
		2.	Andrew S. Tanenbaum, David J. Wetherall	Computer Networks, Global Edition	Pearson	2021
		3.				
	22.2	Additional literature				
		Serial numbe r	A second	Title	Publisher	Year
		1.	David Reed	Balanced Introduction to Computer Science	Pearson	2011
		2.				
		3.				

First year / **3**	**Subject program from the first , second and third cycle of studies**				
1.	Title of the course	Introduction to programming			
2.	Code	ICS11M03			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	1st year/ 1st semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Atanas Hristov			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): This course is the first course in the field of programming techniques and the C programming language . Through this course, students will be introduced to the basics of building programs, using one of the most famous ANSI programming languages. C , as well as in the basic techniques of designing, building, and testing algorithms, along with techniques for debugging them.				
11.	Course content: After completing this course, students should be able to: • know the basic concepts of formal grammar, syntax, and recognize ambiguous grammar; • know the basic constructs of ANSI C, such as if-then-else, while, for, and basic variable types; • become familiar with function declaration and the programming technique recursion, • know how to work with pointers (basic level), arrays, strings, along with some important libraries for input/output and basic string operations; • can show at a conceptual level that a program is correct with respect to a given specification, in a				

	formal (mathematical) way; • solve simple programming problems.				
12.	Learning methods: This course is based on 30 hours of lectures, supplemented by 30 hours of classroom exercises and 30 hours of laboratory exercises.				
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time		Lectures: 30 hours; classroom exercises: 30 hours; laboratory exercises: 30 hours; Independent preparation, projects, homework: 90 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	30 hours	
		15.2.	Audition exercises	30 hours	
		15.3.	Laboratory exercises	30 hours	
16.	Other forms of activities	16.1.	Project tasks	30 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home learning	30 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		90 points	
	17.2.	Seminar paper/project (presentation: written and oral)		5 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English , Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				
	22.1	Mandatory literature			
		Serial number	A second	Title	Publisher	Year
		1.	Atanas Hristov, Naum Tuntev , Ninoslav Marina	Introduction to Programming by Examples	UIST	2022

	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	KA Barclay	ANSI C: Problem Solving and Programming	Prentice Hall	1991
		2.	B. Kernighan, D. Ritchie	The C Programming Language, 3rd Edition	Independently Published	2019

First year / **4**	**First cycle study program**

1.	Title on the teaching subject	Mathematics 1			
2.	Code	ICS11M04			
3.	Studio program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	1st year / 1st semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Aneta Velkoska			
9.	Prerequisites for enrolling in the course	Passed state graduation			
10.	Objectives of the subject program (competencies): The goal of this course is to introduce the basic concepts of Linear Algebra and Calculus. They are essential tools in many areas of mathematics and computer science. Starting with basic definitions and progressing through more advanced ideas, this course will give the student a thorough exposure to the mathematical analysis of differentiation and functions of one variable and the application of the differential in examining the properties of functions of one variable, as well as an overview of the basic techniques used in linear algebra.				
11.	Content of the subject program : ● Sums and products of matrices, the inverse matrix for a given matrix, and determining solutions to systems of linear equations using matrices and Gaussian transforms. ● Arrays and limits of arrays. ● Basic concepts of functions of one variable, implicit functions, composition of functions, inverse functions. ● Basic properties and graphs of linear, quadratic, cubic functions of one variable and higher-order polynomial functions, rational functions, exponential, logarithmic, trigonometric and hyperbolic functions. ● Limits and continuity of a function of one variable ● Differentiation of standard functions of one variable and implicit functions; ● Hospital rule ; ● Determining the nature of stationary points, local extrema; ● Monotonicity of functions. Convexity and concavity of functions. Local extremes ; ● Global extremes ; ● Precise graphing of functions of one variable; ● Rolle's theorem and mean value theorem; ● Approximation of functions using Taylor's theorem.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				

13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Distribution on the available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Others forms on activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homemade learning	35 hours

17.	Way on grading 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Seminar paper/project (presentation: written and oral)	15 points
	17.3.	Activity and participation	5 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English , Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

Literature

22.1 Mandatory literature

Serial number	A second	Title	Publisher	Year
1.	GB Thomas	THOMAS' CALCULUS, 12/E	Pearson Addison-Wesley	2010
2.	S. Leon	LINEAR ALGEBRA WITH APPLICATIONS, 8/E	Pearson Addison-Wesley	2010
3.	H. Anton, I. Bivens, S. Davis	CALCULUS, 10/E	John Willey & Sons, Inc.	2012

22.2 Additional literature

Serial number	A second	Title	Publisher	Year
1.	G. Strang	CALCULUS	Wellesley-Cambridge Press	2010
2.				
3.				

First year / **5**		**First cycle study program**				
1.	Title on the teaching subject	English for technical communication 1				
2.	Code	ICS11M05				
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences				
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle – mandatory subject				
6.	Academic year / semester	1st year / 1st semester	7.	Number of ECTS credits	6	
8.	Teacher	Lina Miloshevska				
9.	Prerequisites for enrolling in the course					
10.	Objectives of the subject program (competencies): After completing this course, students should: • Demonstrate skills in efficient and accurate document writing • To be familiar with the rules of technical communication and the standards of good style and organization • Proofread and edit written documents for accuracy, clarity, conciseness, and appropriateness • Demonstrate skills in oral presentations • To become fully familiar with the standard forms and rules of the various types of written technical documents					
11.	Course content: first -year information technology students , and covers the following elements: defining technical writing; principles of technical writing; technical writing style; writing clear and effective sentences; writing effective paragraphs; writing essays; written correspondence; oral presentation; planning documents (user document/manual); writing compliant documents; creating documents (user guide; reference guide)					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises					
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Distribution on the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework work: 105 hours = Total time of 180 hours				
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45 hours		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours		
16.	Others forms on activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		
		16.3.	Homemade learning - tasks	35 hours		
17.	Way on grading 80 + 15 + 5					

	17.1.	Tests	80 points
	17.2.	Individual work/project (presentation: written and oral)	15 points
	17.3.	Activity and participation	5 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		51 x to 60 points	6 (six) (E)
		61 x to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	The student should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

22. Literature

22.1. Mandatory literature

Serial number	A second	Title	Publisher	Year
1.	John Lennon	Technical communication , 14th edition	Pearson	2017
2.	Brian R. Hollow ay	Fundamentals of technical writing, 4th ed.	Pearson	2014
3.				

22.2. Additional literature

Serial number	A second	Title	Publisher	Year
1.	Richard Gonson - Sheeha n	Technical Communication Strategies for Today, Global Edition, 2nd Edition	Purdue University	2015
2.				
3.				

First year / **6**	**Subject program from the first , second and third cycle of studies**

1.	Title on the teaching subject	Object oriented programming			
2.	Code	ICS12M01			
3.	Studio program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle - mandatory			
6.	Academic year / semester	1st year / 2nd semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Atanas Hristov			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): The aim of the course is to introduce the student to the basic concepts of object-oriented programming. This course focuses on a new programming language for students, Java , and all its related concepts and paradigms. To introduce first -year students to this new programming language, some prior knowledge of certain topics close to the topics of Introduction to Programming is required. This course covers the following topics: syntax, basic methods, algorithms, data types, object-oriented paradigm, console software. Although this course focuses on the programming language, some good elements from the field of software engineering will also be developed.				
11.	Course content: • Designing software in Java as a console application; • Understanding the general concepts of object-oriented programming; • Demonstrate knowledge and understanding of logic in programming; • Demonstrate software development ability; • Acquiring and developing capacity for "developing" software within a group; • Acquire and use the correct terminology of Java and Java programming.				
12.	Learning methods: This course is based on 30 hours of lectures, supplemented by 30 hours of classroom exercises and 30 hours of laboratory exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Distribution on the available time	Lectures: 30 hours; classroom exercises: 30 hours; laboratory exercises: 30 hours; Independent preparation, projects, homework: 90 hours = Total time of 180 hours			
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching	30 hours	
		15.2.	Auditory exercises	30 hours	
		15.3.	Laboratory exercises	30 hours	
16.	Others forms on activities	16.1.	Project tasks	30 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Homemade learning	30 hours	
17.	Way on grading 80 + 15 + 5				
	17.1.	Tests	80 points		

	17.2.	Seminar paper/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction	English and Macedonian		
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures		

	Literature					
	22.1	Mandatory literature				
		Serial number	A second	Title	Publisher	Year
		1.	Herbert Schildt	Java: A Beginner's Guide	McGraw-Hill	2018
		2.	Cay S. Horstmann	Big Java	Wiley	2019
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Harry H., Chris James	Thinking in Java	Programmers Mind Inc.	2014

First year / **7**		**First cycle study program**
1.	Title on the teaching subject	Society and technological transformation
2.	Code	ICS12M02
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study	University of Information Sciences and Technologies "St. Paul the Apostle" -

	program (unit, i.e. institute, department, division)	Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective course from the study program			
6.	Academic year / semester	First year / second semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Dr. Goran Šibakovski			
9.	Prerequisites for enrolling in the course	There is none.			
10.	Course objectives (competences): Students will become familiar with the basic topics of society and technological transformation and will learn about the interconnectedness of social trends and modern technologies. Particular attention is paid to the relationship between society and technology, as well as the dilemma of whether technology is neutral and whether it always leads to social progress. Students will learn to connect contemporary and historical examples of technological trends through specific case studies from different parts of the world. Students will also acquire skills for implementing and developing an agenda for technological transformation in society, as well as recognizing current social and technological trends in the world.				
11.	Course content: 1. Introduction to the subject. 2. The Fourth Industrial Revolution and the Development of Society. 3. Insight into Estonia's path to becoming a technologically advanced society. 4. Strategy for society and technological transformation. 5. Society. Social media. Technological debates. Interaction and identity. Communities and networks. 6. Technological visuality and visibility. Feeling digital. Digital citizenship/citizenship. Digital power and exploration. Digital activism. Mobile culture. 7. Tech giants. Digitalized workplaces. Internet of Things. The rise of smart cities. 8. Comparative case studies and analyses of technological transformation of society in Europe. 9. Comparative case studies and analyses of technological transformation and society in North America. 10. Comparative case studies and analyses of technological transformation and society in Asia. 11. Use of modern media in the developing world. New social movements. Surveillance and the role of databases in contemporary society. 12. Conditions and challenges for technological transformation in the Republic of Macedonia. 13. Challenges of society and the development of technological transformation in the world.				
12.	Learning methods: Lectures and theoretical teaching, exercises, independent seminar work, teamwork in groups, project and independent assignments, homework, consultations.				
13.	Total available fund on time	6 EXT x 30 hours/credit = 180 hours			
14.	Distribution on the available time	45+30+35+35+35 = 180 hours			
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Others forms on activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homemade learning - tasks	35 hours	
17.	Way on assessment				
	17.1.	Tests		80 points	

	17.2.	Individual work/project (presentation: written and oral)		10 points
	17.3.	Activity and participation		10 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			51 x to 60 points	6 (six) (E)
			61 x to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		Regular attendance at classes in accordance with UINT regulations	
20.	Language of instruction		English and Macedonian	
21.	Method of monitoring the quality of teaching		Self-evaluation and mechanisms for monitoring the quality of teaching at UINT	

22.	Literature					
	22.1.	Mandatory literature				
		Serial number	A second	Title	Publisher	Year
		1.	Lindgren, Simon	Digital Media & Society	SAGE Publications	2021
		2.				
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Lim, Tai Wei	Industrial Revolution 4.0, Tech Giants, and Digitized Societies	Palgrave Macmillan	2019
		2.	Mosco, Vincent	Becoming Digital. Toward a Post-Internet Society	Emerald Publishing	2017
		3.				

First year / **8**	**Subject program from the first , second and third cycle of studies**	
1.	Title of the course	Mathematical economics
2.	Code	ICS12M03
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid;

		Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle				
6.	Academic year / semester	1st year / II semester	7.	Number of ECTS credits	6	
8.	Teacher	Prof. Dr. Elena Hadzieva				
9.	Prerequisites for enrolling in the course	/				
10.	Objectives of the course program (competences): Students will be able to analyze demand and consumption (with or without taxation); find equilibrium price and quantity, perform comparative static analysis and interpret the results; use the exponential and logarithmic function in various economic problems; calculate the net present value of an investment and decide whether to invest; be able to pose and solve the problem of finding maximum profit and apply the derivations in various other problems in economics; be able to solve optimization problems (conditional and unconditional); understand and use the concept of consumer and producer surplus.					
11.	Course content: Introductory concepts (numbers, their algebraic properties, equations, inequalities, factoring polynomials, equations). Consumption and demand in a competitive market. Financial mathematics (limits, interest rates, exponential and logarithmic function acceptance, annuities). Consumption function. Marginal and average costs. Finding maximum profit. Functions of several variables - definition, their derivatives and extreme values. Conditional optimization (substitution method, Lagrangian method). Application of integrals: present value of a continuous annuity.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours				
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours		
16.	Other forms of activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		
		16.3.	Home learning	35 hours		
17.	Grading method 80 + 15 + 5					
	17.1.	Tests	80 points			
	17.2.	Seminar paper/project (presentation: written and oral)	15 points			
	17.3.	Activity and participation	5 points			
18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)			
		from 51 to 60 points	6 (six) (E)			
		from 61 to 70 points	7 (seven) (D)			
		from 71 to 80 points	8 (eight) (C)			
		from 81 to 90 points	9 (nine) (B)			
		from 91 to 100 points	10 (ten) (A)			
19.	Requirement for signature and passing the final exam	Students should attend classes regularly, according to the UINT regulations.				
20.	Language of instruction	English , Macedonian				
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures				
	Literature					
	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year

		1.	Vassilis C. Mavron and Timothy N. Phillips	Elements of Mathematics for Economics and Finance	Springer-Verlag London Limited	2007
		2.				
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Knut Sydsæter and Peter Hammond	Essential Mathematics for Economic Analysis, 4 th edition	Pearson Education Limited	2012
		2.	Akihito Asano	An Introduction to Mathematics for Economics	Cambridge University Press	2013
		3.				

First year / **9**		**First cycle study program**			
1.	Title on the teaching subject	English for technical communication 2			
2.	Code	ICS12M04			
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	1st year / 1st semester	7.	Number of ECTS credits	6
8.	Teacher	Lina Miloshevska			
9.	Prerequisites for enrolling in the course				
10.	Upon completion of this course, students should be able to: ● Identify the skills, processes, and products that are considered typical technical writing ● Develop and use technical writing skills to gain expertise in their application in a professional context ● Learn to work collaboratively as well as individually so that students can contribute to successful professional communication ● Effectively use technology to support analysis, planning, and revision of written academic and technical documents ● Develop a professional, responsible, and ethical attitude toward business communication ● Provide students with the knowledge and skills in writing, presentations, and other forms of technical communication that are expected of them in their future roles as scientific and technological professionals				
11.	Course content:				

	Characteristics of technical communication; Writing various types of technical documents, such as: memoranda, professional electronic communication, professional resume, specifications, report, analytical report. Understanding ethical and legal aspects; Writing technical documents; Writing collaboratively; Analyzing the intended audience and purpose of the communication; Researching the topic; Organizing information; Communicating persuasively; Creating documents; Creating charts, reviewing, evaluating and testing documents and websites; Writing reports; Writing proposals; Oral presentations				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Distribution on the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework work: 105 hours = Total time of 180 hours			
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Others forms on activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homemade learning - tasks	35 hours	
17.	Way on grading 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			51 x to 60 points	6 (six) (E)	
			61 x to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam	The student should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction	English			
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures			
22.	Literature				
	22.1.	Mandatory literature			
		Serial number	A second	Title	Publisher	Year

		1.	John Lennon	Technical communication , 14th edition	Pearson	2017
		2.	Brian R. Hollow ay	Fundamentals of technical writing, 4th ed.	Pearson	2014
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Richard Gonson - Sheeha n	Technical Communication Strategies for Today, Global Edition, 2nd Edition	Purdue University	2015
		2.				
		3.				

Second year /1	**Subject program from the first , second and third cycle of studies**				
1.	Title on the teaching subject	Economics of E-commerce			
2.	Code	ICS13M01			
3.	Studio program / Faculty	Faculty of Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list			
6.	Academic year / semester	2nd year / 3rd semester	7.	Number of ECTS credits	
8.	Teacher	Assoc. Prof. Jovanka Damoska Sekuloska			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the course program (competences) : The aim of the course is to recognize the role of the Internet in the process of making business decisions in companies. Students should understand the role and possibilities of online operations as a new strategy for organizing and operating businesses and applying the possibilities of the Internet in creating and maintaining competitive advantages.				
11.	Course content: Fundamentals and development of electronic commerce, Introduction to e - business, e-commerce and e-market ; Network effect and transaction cost theory as aspects of e-commerce economics. Mechanisms, platforms and tools in e-commerce ; E-business models ; Digital business strategies ; Analysis of the e-environment ; Analysis of the internal environment : e-Business competencies ; m-commerce ; Software e-business solutions ; Supplier management system (e - SCM), Marketing in e-commerce ; Payment system in e-commerce				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Distribution on the available time	Lectures: 45 hours; Exercises: 30 hours; Independent			

			preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Others forms on activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homemade learning	35 hours
17.	Way on grading 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Seminar paper/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction		English , Macedonian	
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures	
	Literature			

	22.1	Mandatory literature			
		Serial number	A second	Title	Publisher
		1.	Dave Chaffey, Tanya Hemphill and David Edmundson-Bird	Digital business and e-commerce management 7 th ed.	Pearson
		2.	Kenneth C. Laudon and Carol Guercio Traver	E-commerce 2018: Business, Technology, Society 14/ed	Pearson
		3.			
	22.2	Additional literature			
		Serial number	A second	Title	Publisher
		1.	Turban, King, Lee, Ting-Peng Liang, Deborrah C. Turban	Electronic Commerce: A Managerial and Social Networks Perspective 8/ed	Springer
		2.	Tawfik Jelassi and Albrecht Enders	Strategies for e-Business concepts and cases	Pearson
		3.			

Second year /2	**First cycle study program**				
1.	Title on the teaching subject	Algorithms and data structures 1			
2.	Code	ICS13M02			
3.	Studio program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	2nd year / 3rd semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Ustiana Rechkoska Shikoska			
9.	Prerequisites for enrolling in the course	Introduction to Programming, Object-Oriented Programming			
10.	Objectives of the subject program (competencies): The aim of the course is to introduce the student to basic abstract data structures and algorithms. It will describe and explain how abstract data types are used, including arrays, stacks, queues, lists, doubly linked lists, binary trees and search trees . Students will understand how to write recursive algorithms. Basic sorting and searching algorithms will be explained. Algorithms will be written for all data structures and implemented in an appropriate programming language.				
11.	Course content: Arrays, Pointers and Variables, Stacks and Queues (implementation with arrays and linked lists), Lists, Doubly Linked Lists, Arrays, Sorted Arrays, Binary Trees and Binary Search Trees - definitions and algorithms. Program for presenting recursive algorithms, Recursive and Quick Sort, search and sorting algorithms, Sequential search, binary search, Sorting techniques (bubble sort , selection sort , Insertion Sort , Quick sort , Radix Sort). Techniques for creating algorithms. Calculation of execution time of algorithms.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Distribution on the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Others forms on activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homemade learning	35 hours	
17.	Way on grading 80 + 15 + 5				
	17.1.	Tests	80 points		
	17.2.	Seminar paper/project (presentation: written and oral)	15 points		
	17.3.	Activity and participation	5 points		
18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)		
		from 51 to 60 points	6 (six) (E)		
		from 61 to 70 points	7 (seven) (D)		
		from 71 to 80 points	8 (eight) (C)		
		from 81 to 90 points	9 (nine) (B)		

			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English , Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				
	22.1	Mandatory literature			
		Serial number	A second	Title	Publisher	Year
		1.	Frank M. Carrano and Timothy Henry	Data Abstraction and Problem Solving with C++: Walls and Mirrors, 6th edition	Pearson International Edition	2013
		2.	George T. Heineman, Gary Pollice, Stanley Selkow	Algorithms in a Nutshell_ A Practical	Guide-O'Reilly Media	2016
		3.	Steven S Skiena	The Algorithm Design Manual	Springer	2010
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Robert Sedgewick and Kevin Wayne	Algorithms, 4th Edition	Addison-Wesley Professional	2011
		2.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman	Data Structures and Algorithms	Bell Laboratories, Murray Hill, New	2011

Second year / **3**		**First cycle study program**			
1.	Title on the teaching subject	Databases 1			
2.	Code	ICS13M03			
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	Second year / third semester		Number of ECTS credits	6
8.	Teacher	prof. Dr. Dijana Capeska Bogatinoska			
9.	Prerequisites for				

<table>
<tr><td></td><td>enrolling in the course</td><td colspan="3"></td></tr>
<tr><td>10.</td><td colspan="4">Objectives of the subject program (competencies):
● Students will be introduced to the basic concepts of working with databases, methods of their modeling and implementation.
● Students will gain knowledge about the nature of Database Management Software (DBMS) . Management Systems (DBMSs)), including their structure, design and evaluation.
● Students will gain knowledge about the process of normalization of relational databases.
● Students will gain knowledge about the role of question languages (Structured Query Language (SQL)) standards of current and future development of DBMSs .
● Students will be able to model databases and will know how to practically apply the SQL standard for creating, maintaining, and manipulating relational databases.</td></tr>
<tr><td>11.</td><td colspan="4">Content of the subject program :
1. Introduction to databases, basic concepts of database systems, historical development. (What is a database?, Database tables, table records, types of database management systems, relational database management systems)
2. Database management software (DBMS) and architectures.
3. Real-world model, semantic modeling: entity-relationship model (ER model (ER diagram modeling, entities, attributes, relationships, cardinality)), extended entity-relationship model (EE-R model), UML o object model (class diagram).
4. Relational database model (data models, levels of abstraction, relational model concepts, informal and formal definitions, relational integrity constraints, referential integrity, keys, naming conventions, data normalization)
5. Design of relational databases, transformation of ER model into relational model.
6. Formal query languages: relational algebra and relational calculus.
7. Introduction in question marks languages SQL (Structured Query Language). (What is SQL ?, Purpose of SQL , Who should learn SQL ?, What are the subsets of SQL ?, Data Definition Language, Data Manipulation Language, Data Control Language).
8. SQL syntax, Data types in SQL , SQL operators, SQL expressions.
9. SQL - Commands and operations for data manipulation.
10. SQL - Commands and operations for defining data.
11. SQL Views, SQL Queries and Sub Queries.
12. Constraints, triggers, stored procedures, indexes, analytical queries.
13. Normal forms: first a, second a, third a, Boyce - Codd -ova, fourth and fifth normal forms. Process on normalization .
14. Practical examples .
15. Relational databases vs. NoSQL databases.</td></tr>
<tr><td>12.</td><td colspan="4">Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.</td></tr>
<tr><td>13.</td><td>Total available fund on time</td><td colspan="3">6 ECTS credits x 30 hours/credit = 180 hours</td></tr>
<tr><td>14.</td><td>Distribution on the available time</td><td colspan="3">Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours</td></tr>
<tr><td rowspan="2">15.</td><td rowspan="2">Forms on the teaching activities</td><td>15.1.</td><td>Lectures - theoretical teaching .</td><td>45 hours</td></tr>
<tr><td>15.2.</td><td>Exercises (laboratory, classroom), seminars, teamwork.</td><td>30 hours</td></tr>
<tr><td rowspan="3">16.</td><td rowspan="3">Others forms on activities</td><td>16.1.</td><td>Project tasks</td><td>35 hours</td></tr>
<tr><td>16.2.</td><td>Independent tasks</td><td>35 hours</td></tr>
<tr><td>16.3.</td><td>Homemade learning - tasks</td><td>35 hours</td></tr>
</table>

17.	Way on assessment			
	17.1.	Tests		90 points
	17.2.	Individual work/project (presentation: written and oral)		5 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			51 x to 60 points	6 (six) (E)
			61 x to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		The student must ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction		English and Macedonian	
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures	

22. Literature

22.1. Mandatory literature

Serial number	A second	Title	Publisher	Year
1.	Thomas M. Connolly and Carolyn E. Begg	Database Systems: A Practical Approach to Design, Implementation and Management	Addison Wesley (5th Edition)	2009
2.	Abraham Silberschatz, Henry Korth, S. Sudarshan	Database System Concepts	Fifth Edition, McGraw-Hill	2005
3.	Raghu Ramakrishnan, Johannes Gehrke	Database Management Systems	McGraw-Hill, Science Engineering	2005

22.2. Additional literature

Serial number	A second	Title	Publisher	Year
1.	H. Garcia-Molina, J. Ullman, J. Widom	Database Systems: The Complete Book	Prentice Hall (2nd Edition)	2008
2.	Carlos Coronel, Steven Morris and Peter Rob	Database Systems: Design, Implementation and Management	Course Technology; (9th edition)	2009
3.	R. Elmasri, S. Navathe	Fundamentals of Database Systems	Addison Wesley (6th Edition)	2010

Second year / **4**	**Subject program from the first , second and third cycle of studies**

1.	Title on the teaching subject	Script programming				
2.	Code	ICS13M04				
3.	Studio program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences				
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle – mandatory subject				
6.	Academic year / semester	Second year / third semester	7.	Number of ECTS credits	6	
8.	Teacher	Dr. Ljubinka Sandžakoska / Dr. Daniela Mechkaroska				
9.	Prerequisites for enrolling in the course	there is no				
10.	Objectives of the subject program (competencies): Students should be introduced to the basic concepts of scripting, as well as be able to distinguish between programming and scripting. To be able to use scripting languages. Additionally, students should be able to recognize when a problem can be solved with a scripting language.					
11.	Content of the subject program : 1. Introduction to scripting; differences between scripting and programming 2. What is a script? Creating scripts; Functionalities 3. Languages for scripting 4. Approaches 5. Tools for scripting 6. Scripts for automating application-level processes					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Distribution on the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours				

15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Others forms on activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homemade learning	35 hours

17.	Way on grading 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Seminar paper/project (presentation: written and oral)	10 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)

19.	Requirement for signature and passing the final exam			Students should attend classes regularly in accordance with the UINT regulations.		
20.	Language of instruction			English and Macedonian		
21.	Method of monitoring the quality of teaching			Monitoring UINT control procedures		
	Literature					
	22.1	Mandatory literature				
		Serial number	A second	Title	Publisher	Year
		1.	Eric Matthes	Python Crash Course, 2nd Edition: A Hands-On, Project-Based Introduction to Programming 2nd Edition	No Starch Press;	2019
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Mark Lutz	Learning Python	O'Reilly Media	2013

Second year / **6**		**First cycle study program**			
1.	Title on the teaching subject	Web applications development			
2.	Code	ICS14M01			
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	Second year / fourth semester	7.	Number of ECTS credits	6
8.	Teacher	prof. Dr. Diana Capeska Bogatinoska			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): In this course, students will be introduced to the methods and principles of developing a web application. The flow of data from frontend to backend will be discussed . A detailed description of HTTP Requests . Students will also be introduced to the principles of client-side and server-side form validation. Creating and connecting a database to the web application. Introduction to CRUD operations. It will also be mentioned how the web application can be used as an API . Concepts and				

	rules for development on RESTful API.				
11.	Course content: 1. Introduction to HTML . 2. Introduction to CSS . 3. Introduction to Javascript . 3. Connecting HTML with JavaScript . 4. Introduction to PHP . 5. Using PhpMyAdmin to create and maintain database tables. 6. Setting up the environment for developing a web application using a framework . 7. Setting up on web the application on server . 8. Configuration on the server .				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Distribution on the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Others forms on activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homemade learning - tasks	35 hours	
17.	Way on assessment				
	17.1.	Tests		90 points	
	17.2.	Individual work/project (presentation: written and oral)		5 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			51 x to 60 points	6 (six) (E)	
			61 x to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam	The student must ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction	English , Macedonian			
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures			
22.	Literature				
	22.1.	Mandatory literature			
		Serial number	A second	Title	Publisher	Year

		1.	Michael Mendez	The Missing Link: An Introduction to Web Development and Programming	Open SUNY Textbooks	2014
		2.	Matt Stauffer	Laravel: Up & Running: A Framework for Building Modern PHP Apps	O'Reilly Media; 2nd edition	2019
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Kevin Tatroe, Peter MacIntyre	Programming PHP: Creating Dynamic Web Pages	O'Reilly Media; 4th edition	2020
		2.				
		3.				

Second year / **7**		**First cycle study program**			
1.	Title of the course	Business law			
2.	Code	ICS14M02			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	2nd year / 4th semester	7.	Number of ECTS credits	6
8.	Teacher	Dr. Ivan Bimbilovski			
9.	Prerequisites for enrolling in the course	Passed state graduation			
10.	Objectives of the subject program (competencies): At the end of the semester, students will be able to: • To understand and explain the role of law in economic relations and business transactions; • To understand and explain the functioning of the free market and entrepreneurship and the protection that the law provides for them; • To understand the role of the judiciary in protecting personal freedom and private property; • To apply analytical and logical thinking as one of the techniques for making business decisions; • To understand and apply business ethics and social responsibility.				
11.	Course content: The course program is basically a legal program that is adapted to the specifics of the Digital Business Informatics study program, i.e. the needs of Digital Business Informatics students, and addresses topics and problems such as: the legal and constitutional foundations of business; the role of courts and alternative dispute resolution in business; liability for damage caused when using purchased products; intellectual property in business; use of the Internet, social media and privacy in business; criminal offenses and computer crime in business; business ethics; consumer protection; securities; the role of banks in business; rights of creditors, bankruptcy and liquidation; working through an				

	intermediary or attorney-in-fact; labor law and labor relations; company law and how to establish and manage a small business; investor protection; insider trading; corporate governance; property rights and other real rights in business; insurance; environmental protection in business; the role of international law in the global economy, etc.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English , Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		

Literature

Required literature

	Serial number	A second	Title	Publisher	Year
22.1	1.	Roger LeRoy Miller	Business Law Today, the Essentials: Text and Summarized Cases	Cengage Learning	2016

Additional literature

	Serial number	A second	Title	Publisher	Year
22.2	1.	Alix Adams, Stephanie Caplan, Graeme Lockwood	Law for Business Students, 11th Edition	Pearson	2020
	2 .	Fred S. Steingold	Legal Guide for Starting and Running a Small Business , 15th Edition	Nolo	2017

Second year / **8**		**First cycle study program**			
1.	Title on the teaching subject	Software engineering			
2.	Code	ICS14M03			
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	Second year / fourth semester	7.	Number of ECTS credits	6 (six)
8.	Teacher	Assoc. Dr. Aleksandar Karadimche			
9.	Prerequisites for enrolling in the course	Object-oriented programming , Computer networks / Network technologies			
10.	Objectives of the subject program (competencies): Gaining basic knowledge of methodologies for the design and implementation of software systems through requirements analysis, development and analysis of the design, implementation, integration and testing of the software. They will become familiar with the basic models of software processes and the ability to use them practically in specific projects. Through the analysis of a software development problem, the design of a modular structure to solve the problem and the analysis and evaluation of alternatives; implementation of efficient and correct modules, their integration and testing, planning and management of software projects.				
11.	Course content: Introduction to software engineering, software characteristics and software projects, software development process and methodologies, decomposition, abstraction, object model, requirements analysis and modeling. Software process models: waterfall model, evolutionary development model and agile software development. Software process models: incremental development model, scrum development model , spiral model, extreme programming model. Features, scenarios and engineering stories. Software architecture. Cloud-based software. Microservices-based architecture. Software security and privacy. Confidential programming. Introduction to testing, functional testing, systematic testing. Fundamentals of the UML language. Design on software systems with the UML language .				
12.	Learning methods: This course is based on 45 hours of lectures and 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Distribution on the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Others forms on activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homemade learning - tasks	35 hours	
17.	Way on grading 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			51 x to 60 points	6 (six) (E)	
			61 x to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	

				from 81 to 90 points	9 (nine) (B)	
				from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam			Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction			English , Macedonian		
21.	Method of monitoring the quality of teaching			Monitoring UINT control procedures		
22.	Literature					
	22.1.	Mandatory literature				
		Serial number	A second	Title	Publisher	Year
		1.	Sommerville, Ian	Engineering Software Products: An Introduction to Modern Software Engineering, Global Edition	Pearson	2020
		2.				
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Frank Tsui, Barbara Bernal, Orlando, Karam.	Essentials of Software Engineering, Fifth Edition	Jones & Bartlett Learning	2022
		2.				
		3.				

Third year / **1**		**First cycle study program**			
1.	Title on the teaching subject	Business information systems			
2.	Code	ICS15M01			
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	third year / fifth semester	7.	Number of ECTS credits	6 (six)
8.	Teacher	Dr. Aleksandar Karadimche			
9.	Prerequisites for enrolling in the course				

10.	Objectives of the subject program (competencies): Information systems available for the operation of companies and their basic characteristics. Criteria for selecting and installing a business information system. Analytical tools for integrating different information systems in the company			
11.	Course content: Fundamentals of the business information system (BIS), New approaches to information systems and architectures, Introduction to a business information system, Data, information management and information security, Conceptual and logical aspects of business information systems, Components of a business information system, Operational aspects of a business information system (installation), Integration of separate business information systems, Master data management, Business intelligence systems and the business information system, BI and the supplier system, Information delivery via Web 2.0., Advanced technologies in BI.			
12.	Learning methods: This course is based on 45 hours of lectures and 30 hours of exercises.			
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours		
14.	Distribution on the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours
16.	Others forms on activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homemade learning - tasks	35 hours
17.	Way on grading 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Individual work/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			51 x to 60 points	6 (six) (E)
			61 x to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction	English , Macedonian		
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures		
22	Literature			
	22.1.	Mandatory literature		

.		Serial number	A second	Title	Publisher	Year
		1.	Boris Shishkov	Designing Enterprise Information Systems: merging enterprise modeling and software specification	Springer	2020
		2.	Monique Snoeck	Enterprise Information Systems Engineering	Springer	2014
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Svyatoslav Kotusev	The practice of Enterprise Architecture: a modern approach to business and IT alignment	SK Publishing	2018
		2.				
		3.				

Third year / **2**	**First cycle study program**

1.	Title on the teaching subject	Probability and statistics			
2.	Code	ICS15M02			
3.	Studio program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	3rd year / 5th semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Aneta Velkoska			
9.	Prerequisites for enrolling in the course	Mathematics 1			
10.	Objectives of the subject program (competencies): The aim of this course is to introduce the basic concepts of probability and statistics so that the student can perform simple data analysis. The emphasis will be on basic concepts and problem solving, rather than theory. After completing the course, students should be able to ● Use statistical methodology and tools in the process of solving engineering problems ● Organizing, displaying, and describing data using tables and graphs ● Explanation of numerical characteristics of data: measures of central tendency, measures of variability, and measures of relative position ● They distinguish between an experiment and a research process. ● Understand the basic concepts of probability, random variables, and probability distributions				

	● Identify when and how to use the Normal Probability Distribution Model ● Calculate sampling distributions, point estimates of parameters, and understand the central limit theorem. ● Calculate confidence intervals for sample parameters ● Formulate zero and alternative hypothesis ● Test hypotheses about population proportions and means ● Explain the meaning of *the p* -value in hypothesis testing ● Identify when and how to use *the t* -distribution ● Identify when correlation and regression analysis are appropriate ● Calculate and interpret correlation coefficients and regression equations ● Conduct a χ^2 – test of independence			
11.	Content of the subject program : ● Inferential analysis process, population, sample ● The descriptive statistics - Tables and graphs ● Descriptive Statistics - Measures of Central Tendency and Variability ● Experiment, Event, Space of elementary events, counting techniques, Probability, Conditional probability, Total probability and Bayes' rule ● Random variables, mean and variance ● Binomial, Poisson, and Hypergeometric Probability Distributions ● Normal and other continuous probability distributions ● Random sample , Central border theorem ● Point and interval estimates / confidence interval ● Hypothesis Tests for Mean and Proportion ● Linear regression and correlation ● χ^2 - test for independence			
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.			
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Distribution on the available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Others forms on activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homemade learning	35 hours
17.	Way on grading 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Seminar paper/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)

19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction		English , Macedonian			
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures			
	Literature					
	22.1	Mandatory literature				
		Serial number	A second	Title	Publisher	Year
		1.	M. DeGroot and M. Schervish	Probability and Statistics	Pearson Education	2010
		2.	J. Schiller and R. Srinivasan	Probability and Statistics	Schaum	2008
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	RE Walpole, RH Myers, SL Myers K. Ye	Probability & Statistics for Engineers & Scientists	Prentice Hall	2011
		2.				
		3.				

Third year / **3**	**Subject program from the first , second and third cycle of studies**

1.	Title on the teaching subject	Economic analysis of business and financial operations				
2.	Code	ICS15M03				
3.	Studio program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences				
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list				
6.	Academic year / semester	third year /fifth semester	7.	Number of ECTS credits	6	
8.	Teacher	Assoc. Prof. Jovanka Damoska Sekuloska				
9.	Prerequisites for enrolling in the course	There is none.				
10.	Objectives of the course program (competences) : Students will be able to analyze aspects of financial operations. To create and analyze financial reports and use the data in the planning process. To master the concepts of time value of money, methods of capital investment. Students will gain knowledge and skills for risk assessment and calculation and will be able to understand the basic characteristics of securities and how they are valued.					
11.	Course content: Introduction to business and finance, Financial statements, Financial analysis, Financial planning, Operating and financial leverage, Time value of money, Risk and return, Valuation of securities, Capital budgeting, Capital budgeting techniques, Long-term financing, Short-term financing.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Distribution on the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours				

15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Others forms on activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homemade learning	35 hours

17.	Way on grading 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Seminar paper/project (presentation: written and oral)	15 points
	17.3.	Activity and participation	5 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English , Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

Literature

22.1	Mandatory literature				
	Serial number	A second	Title	Publisher	Year
	1.	Eugene F. Brighman and Joel F. Houston	Fundamentals of Financial Management 14/ed	Cengage Learning	2016
	2.	Stanley B. Block, Geoffrey A. Hirt and Bartley R. Danielsen	Foundations of Financial Management 17/ed	McGraw-Hill	2019
	3.	James C. Van Horne and John M. Wachowicz, Jr.	Fundamentals of Financial Management 13/ed	Pearson Education	2008
22.2	Additional literature				
	Serial number	A second	Title	Publisher	Year
	1.	Stanley B. Block, Geoffrey A. Hirt	Foundations of Financial Management 13/ed	McGraw-Hill	2009
	2.				
	3.				

Third year/ **6**		**First cycle study program**
1.	Title of the course	Information Systems Management
2.	Code	ICS16M01
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences

4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	third year / sixth semester	7.	Number of ECTS credits	6 (six)
8.	Teacher	Dr. Aleksandar Karadimche			
9.	Prerequisites for enrolling in the course	Software Engineering			
10.	Objectives of the subject program (competencies): Through the course program, students see the direct connection between information systems (IS) and business performance. Namely, by applying information systems and technologies in the operations of companies, business goals are achieved - operational, tactical and strategic decisiveness, launching new products and services, competitive advantage, sustainability, rapprochement with customers and suppliers, making better decisions, survival. Upon completion of the course, the student is expected to understand and have in-depth knowledge in the application of models and techniques for managing management information systems, to have in-depth knowledge of the purposes of business and e-business systems, to have the knowledge to establish a digital organization, to have in-depth knowledge of approaches for implementing mass IS, to have broad knowledge of determining key applications and paradigms in a company, to know the current situation in the digital era, to know how to apply IS in making strategic decisions, to have basic knowledge of ethical behavior as an IT manager and to know how to apply security frameworks in IS.				
11.	Course content: 1. Business models and competitive strategies, relationship between the organizational structure of companies and information structures, types of organizational structures 2. Goals of business and e-business systems 3. Need for management and types of management within a company (with special reference to the goals of IS management), digital organization, security management and ethics in IS 4. The contribution of IS to the work of a company (strategic, competitive, operational level) 5. ICT infrastructure and its impact on the development of IS in a company, IT mass systems 6. Key applications and paradigms how they are determined in relation to the strategic goals of the company (e.g. profit centers, optimization of the number of users, satisfied users, etc.) 7. Digital era and its impact on IS in companies (globalization, personalization, penetration, involvement) 8. Decision support systems, knowledge management systems 9. Trends and challenges in information management information systems.				
12.	Learning methods: This course is based on 45 hours of lectures and 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homework - assignments	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)	up to 50 points		5 (five) (F)	
		51 x to 60 points		6 (six) (E)	
		61 x to 70 points		7 (seven) (D)	

				from 71 to 80 points	8 (eight) (C)	
				from 81 to 90 points	9 (nine) (B)	
				from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam			Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction			English, Macedonian		
21.	Method of monitoring the quality of teaching			Monitoring UINT control procedures		
22.	Literature					
	22.1.	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Kenneth C. Laudon and Jane P. Laudon	Management Information Systems: Managing the Digital Firm, 17th Global Edition	Pearson ISBN 978-0-13-697127-6	2021
		2.				
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	James O'Brien, George Marakas	Management Information Systems, 10th Edition	McGraw-Hill/Irwin	2010
		2.				
		3.				

Third year/ **7**	**Subject program from the first , second and third cycle of studies**

1.	Title of the course	Decision Methods			
2.	Code	ICS16M02			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	III year/ 6th semester	7.	Number of ECTS credits	6
8.	Teacher	teacher from UINT			
9.	Prerequisites for enrolling in the course	/			
10.	Objectives of the course program (competences): Students will understand the concept of algorithm and use it to classify, locate and sort various data, as well as to solve various problems; understand				

	the concepts of graph and network and use them to model problems in economics and entrepreneurship; formulate linear programming problems, as well as find their optimal solution.				
11.	Contents on the subject program : Algorithms (bubble sort, quick sort, binary search, packing). Graphs and networks. Definition and types. Graph algorithms (Kruskal , Prim , Dijkstra algorithms). Euler and Hamilton paths. Network analysis. Critical events. Critical activities. Critical path. Linear programming. Methods for solving linear programming problems: Geometric method, Vertex testing method.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper/project (presentation: written and oral)		10 points	
	17.3.	Activity and participation		10 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should attend classes regularly, according to the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		

Literature

Required literature

Serial number	A second	Title	Publisher	Year
1.	John Hebborn	Decision Mathematics 1	Heinemann, Pearson Education Limited	2000
2.				
3.				

Additional literature

Serial number	A second	Title	Publisher	Year
1.	Sue De Pomerai, John Berry	Decision Mathematics (Discovering Advanced Mathematics)	Collins Educational; 2nd edition	2001

		2.				
		3.				

Third year/ **8**		**First cycle study program**			
1.	Title of the course	Data visualization			
2.	Code	ICS16M03			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	Third year / sixth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dijana Capeska Bogatinoska			
9.	Prerequisites for enrolling in the course	Object-oriented programming			
10.	Objectives of the subject program (competencies): ● Students will learn to program in R and use R for effective data analysis. ● Students will learn to install and configure software necessary for a statistical programming environment. ● Students will learn statistical computing which includes programming in R , reading data in R , accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code. ● Students will learn how to access and retrieve data from the web, from APIs , from databases, etc. They will also learn the basics of data cleaning and how to make data “clean.” Clean data significantly speeds up the data analysis process . The basics needed to collect, clean, and share data will be covered. ● Students will learn basic research techniques for summarizing data. These techniques are typically applied before formal modeling begins and can aid in the development of more complex statistical models. Research techniques are also important for eliminating or confirming potential hypotheses. ● Students will learn in detail about visualization systems in R as well as some of the basic principles of constructing data graphics. Some of the common multivariate statistical techniques used for visualization of high-dimensional data will also be covered. ● Students will also learn the principles of data visualization, as well as visualization tools for presentation for publication/publishing.				
11.	Course content: 1. Introduction. Covers the basics to get started with R. (Installing R , Writing Code / Setting Up Your Working Directory, Overview and History of R , Data Types, Reading Tabular Data, Subsets, Vectorized Operations) 2. Programming with R – control structures and functions, Scoping Rules . 3. Loop functions (lapply , apply , mapply , tapply , split) and debugging tools in R 4. Simulation and Profiling - str function, Random number generation, Linear model simulation, Random sampling				

	5. Data extraction and cleaning - finding data and reading different types of files (raw and processed data, downloading files, reading local files, reading Excel files , reading XML , reading JSON , using data . table , reading data from the web) 6. Data Acquisition and Cleaning Part 2 (Subsetting and Sorting, Summarizing Data, Creating New Variables) 7. Data Acquisition and Cleaning Part 3 (Data Transformation, Data Management) Frames with dplyr , data merging, editing text variables, working with dates, data resources) 8. Analyzing Exploratory Data Part 1 (Principles of Analytical Graphics, Exploratory Graphs, Plotting Systems in R , Basic Plotting System in R , Graphing Tools in R) 9. Exploratory Data Analysis Part 2 (Graphics in R, Lattice Plotting System, Plotting with ggplot 2) 10. Graphical representations of very high dimensional data (clustering and dimension reduction techniques) 11. Case studies in research data analysis 12. Data visualization principles 13. Visualization for presentation publishing; visualization tools			
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.			
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homework - assignments	35 hours
17.	Method of assessment			
	17.1.	Tests		90 points
	17.2.	Individual work/project (presentation: written and oral)		5 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			51 x to 60 points	6 (six) (E)
			61 x to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		The student must ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction		English, Macedonian	
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures	

22.	Literature					
	22.1.	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Roger D. Peng	R Programming for Data Science	Lean Publishing	2019
		2.	Roger D. Peng	Exploratory Data Analysis with R	Lean Publishing	2015
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	H. Wright	Introduction to Scientific Visualization	Springer	2007
		2.				
		3.				

Fourth year/ **1**	**Subject program from the first , second and third cycle of studies**				
1.	Title of the course	ERP Systems Economics			
2.	Code	ICS17M01			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	Fourth year/seventh semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Jovanka Damoska Sekuloska			
9.	Prerequisites for enrolling in the course	There is none.			
10.	Objectives of the course program (competences) : • to introduce students to business information systems, to understand the basic business functional units and how they are interconnected. • to show how an integrated system can be in the interest of enterprise objectives by providing managers with accurate, timely and consistent information. • to understand how ERP Systems are used to optimize company processes and increase operational efficiency.				
11.	Course content: Why ERP systems? Economic justification of introducing ERP systems; Functioning of ERP systems; Subjects on the ERP systems market; Phases in the ERP life cycle; Analysis of the justification and functionality of ERP; Risk analysis; Cost - benefit analysis; ERP system modules :				

	procurement support systems and processes, marketing system and sales processes, production and supply system, accounting ERP system, processes related to human resources in the company; Modeling of processes, their improvement and implementation of ERP ,			
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.			
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours
17.	Grading method 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Seminar paper/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)	up to 50 points		5 (five) (F)
		from 51 to 60 points		6 (six) (E)
		from 61 to 70 points		7 (seven) (D)
		from 71 to 80 points		8 (eight) (C)
		from 81 to 90 points		9 (nine) (B)
		from 91 to 100 points		10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction	English, Macedonian		
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures		

Literature

Required literature

Serial number	A second	Title	Publisher	Year
1.	Marianne Bradford	Modern ERP: Select, Implement & Use Today's Advanced Business Systems 4/ed	Marianne Bradford	2020
2.	Lineke Sneller	A Guide to ERP: Benefits, Implementation and Trends	bookboon.com	20 14
3.				

Additional literature

Serial number	A second	Title	Publisher	Year
1.	Simha R. Magal and Jeffrey Word	Integrated Business Processes with ERP Systems 1/ed	Wiley	2011

		2.	Daniel E. O'Leary	Enterprise Resource Planning Systems: Systems, Life Cycle, Electronic Commerce and Risk	Cambridge University Press	2000
		3.				

Fourth year/ **2**		**First cycle study program**			
1.	Title of the course	Artificial intelligence			
2.	Code	ICS17M02			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	Fourth year / seventh semester	7.	Number of ECTS credits	6 (six)
8.	Teacher	Assoc. Dr. Aleksandar Karadimche			
9.	Prerequisites for enrolling in the course	Introduction to programming			
10.	Objectives of the subject program (competencies): The aim of the course is to determine the methods and architectures used to build a computer application that will be based on human intelligence. This allows first to determine the most appropriate way to represent a problem , and by applying the methods of intelligent systems, the corresponding problem to be optimally solved.				
11.	Course content: Introduction to Artificial Intelligence Knowledge representation. Introduction to search. Uninformed search. Informed search. Contrastive search. Condition fulfillment. Logical agents and predicate calculus. Probability reasoning. Knowledge representation. Learning of artificial systems. Natural language processing. Visual object recognition. Review and discussion of the application of Artificial Intelligence in everyday life.				
12.	Learning methods: This course is based on 45 hours of lectures and 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homework - assignments	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Individual work/project		15 points	

		(presentation: written and oral)		
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			51 x to 60 points	6 (six) (E)
			61 x to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction		English, Macedonian	
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures	

22.

Literature

Required literature

	Serial number	A second	Title	Publisher	Year
22.1.	1.	Stuart Russell, Peter Norvig	Artificial Intelligence, a modern approach, 4th Ed.	Pearson Series in Artificial Intelligence	2020
	2.				
	3.				

Additional literature

	Serial number	A second	Title	Publisher	Year
22.2.	1.	Wolfgang Ertel	Introduction to Artificial Intelligence	Springer International Publishing, 2nd edition	2017
	2.				
	3.				

Fourth year/ **3**	**First cycle study program**	
1.	Title of the course	Distributed Systems
2.	Code	ICS17M03
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid;

		Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	Fourth/seventh	7.	Number of ECTS credits	6
8.	Teacher	Full Professor Dr. Ustiana Rechkoska-Shikoska			
9.	Prerequisites for enrolling in the course	Databases, Algorithms and Data Structures			
10.	Objectives of the subject program (competencies): The student will acquire knowledge about Distributed Systems, Distributed Systems Architectures; Processes, Communications; Naming, Synchronization; Distributed Databases – DBP, Distributed Database Management System – SUDBP, design, object databases, UML language , transaction management and hybrid databases, Security of Distributed Systems.				
11.	Course content: Object-oriented and service-oriented distributed systems; Objects, connectivity and databases. Relational database schema, redundancy, normalization, functional dependency. Data distribution. Types of distributed databases - DBP. Distributed DBP. Levels of work with DBP. Updating the database from multiple locations. Distributed information systems. Distributed transaction programs of the information system by locations. Threats in distributed systems. Features and use of the UML language . Logic and design of DBP. Object databases. Object-oriented database languages . Architecture and model of object databases. Operations over object databases. Deductive databases. Hybrid databases. Distributed algorithms. Data analysis and mining, OLAP . Transact - SQL features in MS SQL Server , scalar and table functions, stored procedures, switches. Databases with management systems. LINQ that Entity Framework . Decentralized algorithms; Distributed systems security; Authentication; Access control; DoS ; Secure mobile code; A secondization management .				
12.	Learning methods: Oral presentation method, lecture method, independent work method and technical aid method.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 10 + 10				
	17.1.	Tests	80 points		
	17.2.	Seminar paper/project (presentation: written and oral)	10 points		
	17.3.	Activity and participation	10 points		
18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)		
		from 51 to 60 points	6 (six) (E)		
		from 61 to 70 points	7 (seven) (D)		
		from 71 to 80 points	8 (eight) (C)		
		from 81 to 90 points	9 (nine) (B)		
		from 91 to 100 points	10 (ten) (A)		
19.	Requirement for signature and passing the	Students should ensure regular attendance at classes in			

	final exam		accordance with the UINT regulations.			
20.	Language of instruction		English, Macedonian			
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures			
	Literature					
	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Maarten van Steen, Andrew S. Tanenbaum	Distributed Systems, Third Edition, Version 3.01. 2017	CreateSpace Independent Publishing Platform	2017
		2.	Garcia-Molina H., Ullman JD, Widom., J .	Database Systems: The Complete Book	Prentice Hall	2009
		3.	Ben-gan, I	Microsoft SQL Server 2008 T-SQL Fundamentals	Microsoft Press	2008
		4.	Calvert, C.; Kulkarni, D.	Essential LINQ	Addison-Wesley	2009
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Satinder Bal Gupta, Aditya Mittal	Introduction to Database Management Systems" Second Edition	Typeset at Sukuvisa Enterprises, Delhi	2017

Fourth year/6		**First cycle study program**			
1.	Title of the course	Business Intelligence and Analytics			
2.	Code	ICS18M01			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	4th year/ 8th semester	7.	Number of ECTS credits	6 (six)
8.	Teacher	Dr . Aleksandar Karadimche			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): The course provides business students with an introduction to the fundamental concepts and tools needed to understand the role of modern business analytics in organizations, apply basic business analytics tools in a spreadsheet environment, and communicate with analytics professionals to effectively use and interpret analytical models and results to make better business decisions . A balanced, holistic approach is required in viewing business analytics from the descriptive, predictive, and prescriptive perspectives that define the discipline.				
11.	Course content: Business and Analytics Fundamentals. **Descriptive Analytics** : Data visualization, descriptive statistical measures, probability distributions and data modeling, sampling and estimation, and statistical inference. **Predictive Analytics** : Develop approaches to applying trend and regression analysis, forecasting,				

	introductory data mining techniques, building and analyzing spreadsheet models, and simulation and risk analysis. **Prescriptive Analytics** : Models and applications for linear, integer, and nonlinear optimization. **Optimization Analysis** , focuses on what-if and sensitivity analysis in optimization. **Decision Making** : Tools and techniques for decision analysis.				
12.	Learning methods: This course is based on 45 hours of lectures and 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homework - assignments	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			51 x to 60 points	6 (six) (E)	
			61 x to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction	English, Macedonian			
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures			
22.	Literature				
	22.1.	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	James R. Evans	Business Analytics Methods, Models, and Decisions, 3rd edition, Global Edition	Pearson	2020
		2.	Walter R. Paczkowski	Business Analytics Data Science for Business Problems	Springer	2021
		3.				

	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann	Business Analytics, Fourth Edition	Cengage Learning, Inc.	2021
		2.				
		3.				

Fourth year/7	**Subject program from the first , second and third cycle of studies**				
1.	Title of the course	Entrepreneurship			
2.	Code	ICS18M02			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	Fourth Year Year/Eighth Semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Jovanka Damoska Sekuloska			
9.	Prerequisites for enrolling in the course	There is none.			
10.	Objectives of the subject program (competencies): To introduce students to the basic concepts and aspects of entrepreneurship. Students should understand the basic elements and processes in creating and developing a new startup business. To help students develop their entrepreneurial skills and perspectives through practical discussions and introduction to the real world of entrepreneurship.				
11.	Course content: 1. Decision to be an entrepreneur - Introduction to entrepreneurship 2. Development of successful business ideas - Identifying opportunities and generating ideas - Feasibility analysis - Development of an effective business model - Industry and competition analysis - Writing a business plan 3. The path from idea to entrepreneurial company - Ethical and legal foundations - Assessment of financing opportunities - Creating a team 4. Management and development of an entrepreneurial firm - Unique marketing strategy - Meaning of intellectual property - Evaluating challenges and growth - Strategies for company growth				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours;			

			Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17.	Grading method 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Seminar paper/project (presentation: written and oral)	10 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

Literature

22.1	Required literature				
	Serial number	A second	Title	Publisher	Year
	1.	Bruce R. Barringer and R. Duane Ireland	Entrepreneurship: Successfully Launching New Ventures Updated 6e	Pearson	2022
	2.	Robert Hisrich, Michael Peters and Dean Shepherd	Entrepreneurship 11/ed.	McGraw-Hill	2020
	3.				
22.2	Additional literature				
	Serial number	A second	Title	Publisher	Year
	1.	Heidi M. Neck, Christopher P. Neck and Emma L. Murray	Entrepreneurship: the practice and mindset	SAGE	2021
	2.	Dafna Kariv	Entrepreneurship: An International Introduction	Routledge	2011
	3.				

Fourth year/8	**Subject program from the first , second and third cycle of studies**	
1.	Title of the course	Graduation Thesis and Preparation

2.	Code	ICS18M03				
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences				
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle				
6.	Academic year / semester	4th year/ 8th semester	7.	Number of ECTS credits	6	
8.	Teacher	According to the decision of the Senate of the UINT				
9.	Prerequisites for enrolling in the course	The student can apply for the diploma if he/she has earned a minimum of 200 ECTS credits in the four-year study programs.				
10.	Objectives of the subject program (competencies): A thesis is a completed project that integrates the knowledge and skills that a student has acquired during their academic studies. The student is completely independent in managing and performing the tasks that are part of the diploma work. During the preparation, the student's ability and responsibility for timely and correct planning, management and management of a project play a major role. The procedure is carried out under the mentorship of a teacher elected to a teaching-scientific title at the Faculty. The diploma work is worked on within precisely specified deadlines, and it is defended after approval by the mentor before a commission for assessing the diploma work.					
11.	Course content: The diploma thesis is realized through four steps: 1. Submitting a proposal for scientific research work in written form and explaining the methodology, literature, sources and research techniques. 2. Realization of scientific research work, which will converge into a diploma project. 3. Report on the student's work in completing the thesis. 4. Defense and evaluation of the thesis.					
12.	Learning methods: Self-study and weekly consultations with faculty representatives.					
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Allocation of available time	Consultations: 60 hours; Self-study 120 hours = 180 hours				
15.	Forms of teaching activities	15.1.	Consultations: 15 weeks x 4 hours per week	60 hours		
		15.2.	Independent learning	120 hours		
16.	Other forms of activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		
		16.3.	Home learning	35 hours		
17.	Grading method 80 + 15 + 5					
	17.1.	Tests	80 points			
	17.2.	Seminar paper/project (presentation: written and oral)	15 points			
	17.3.	Activity and participation	5 points			
18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)			
		from 51 to 60 points	6 (six) (E)			
		from 61 to 70 points	7 (seven) (D)			
		from 71 to 80 points	8 (eight) (C)			
		from 81 to 90 points	9 (nine) (B)			
		from 91 to 100 points	10 (ten) (A)			
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.				
20.	Language of instruction	English, Macedonian				

21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures			
	Literature					
	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Students will use a variety of library and internet sources related to the topic of the thesis .			
		2.	Violeta Panzova	Handbook for writing student papers	Faculty of Philosophy – UKIM Skopje	2011
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Umberto Eco	How to Write a Thesis	MIT Press	2015
		2.				
		3.				

Second year /2	**First cycle study program**				
1.	Title on the teaching subject	Digital management			
2.	Code	ICS18M04			
3.	Studio program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	2nd year / 3rd semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Ustiana Rechkoska Shikoska			
9.	Prerequisites for enrolling in the course	Passed state matriculation examination			
10.	Objectives of the subject program (competencies): By completing this course, the student will have knowledge of the use of information systems in business settings (IT applications in business process management)				
11.	Course content: ● Information Systems Management ● Information and Communication Technologies and Management Strategies ● Database Management Systems ● Change Management ● Information Technologies and Organization ● Information and Communication Systems Architecture ● Organizing and Leading ICT Functions ● Managing ICT Outsourcing ● IT Planning ● Knowledge Management ● Risk Management				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			

14.	Distribution on the available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Others forms on activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homemade learning	35 hours
17.	Way on grading 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Seminar paper/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction		English , Macedonian	
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures	

Literature

Mandatory literature

Serial number	A second	Title	Publisher	Year
1.	Kenneth Laudon, Jane Laudon	Management Information Systems: Managing the Digital Firm, (16th Edition),	Pearson	2020
2.	Carlos Coronel and Steven Morris	Database Systems: Design, Implementation, & Management", (13th Edition)	Cengage Learning	2018
3.				

Additional literature

Serial number	A second	Title	Publisher	Year
1.	Gregory Dess, Gerry McNamara, Alan Eisner, Seung-Hyun Lee	Strategic Management Text And Cases	McGraw-Hill Education	2020
2.				

Attachment No. 3		**Subject program from the first cycle of studies**				
1.	Title of the teaching subject	Multimedia Data Processing				
2.	Code	ICS12E01				
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences				
4.	Organizer of the study program (unit, i.e. institute, department)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle – elective course from the unit				
6.	Academic year / semester	Year	1	semester	II	
7	Course Workload Expressed in ECTS Credits	6				
8.	Teacher (in case of multiple teachers, the responsible instructor is designated)	Associate Professor Rasim Salkoski, PhD				
9.	Language of instruction	English				
10.	Prerequisites for Attending and Passing the Course	Mathematics 1, Introduction to Programming				
11.	Course Objectives (Competencies) and Learning Outcomes:	Introducing the student to the basic concepts of working with multimedia data, the ways of modeling and implementing them, and manipulating them.				
12.	Detailed course content by chapters and units, with learning outcomes for each chapter	Introduction, Introduction to Multimedia, Signals, Analog and Digital Data, Sampling and Quantization, Audio/Sound, Introduction to Digital Audio, Representation of Audio Data, WAV Audio Format, Audio Data Compression, MP3, Image, Image Presentation, Color Models – RGB, YCbCr, Main Image Formats, Bitmap, Lossless Image Compression - Run-length Coding (PCX), Lossy Image Compression - Cosine Transform Based Coding (JPEG), Video, Video Data and the Need for Compression, Video Compression Standards – MPEG, H263, H264, Multimedia Transmission over the Internet, Scalable Video Coding, Multiple Description Coding.				
13	Interconnection of Courses					
14.	Detailed Description of the Teaching and Working Methods for the Course	Lectures: 45 hours; Exercises: 30 hours; Independent study, projects, homework: 105 hours = Total time of 180 hours				
15.	Total Available Time Allocation	6 ECTS credits x 30 hours/credit = 180 hours				
16.	Forms of Teaching Activities	16.1.	Lectures – theoretical instruction, hours	45 hours		
		16.2.	Exercises (laboratory, auditory), seminars, teamwork: hours	30 hours		
		16.3.	Practical work: hours			
17.	Other forms of activities	17.1.	Project assignments: hours	35 hours		
		17.2.	Independent tasks: hours	35 hours		
		17.3.	Home study – tasks	35 hours		
18	Conditions for Signature	Students should ensure regular attendance in classes according to the UINT regulations.				
19	Assessment Method					
	19.1.	Tests: Points		80 points		
	19.2.	Seminar paper/project, written and oral presentation: points		15 points		

	19.3.	Final exam: points		5 points	
20	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
21.	Method for monitoring the quality of teaching		Monitoring the procedures for UNIT control		
22.	Literature				
	22.1.	Mandatory Literature			
		No.	Author	Title	Publisher	Year
		1.	Angelides, Marios C.; Dustdar, Schahram.	Multimedia Information Systems	Springer Science & Business Media. ISBN: 0792399153	1997
		2.				
		3.				
	22.2.	Additional Literature			
		No.	Author	Title	Publisher	Year
		1.	Iain E. G. Richardson	H.264 and MPEG Video Compression	John Wiley & Sons Ltd	2003
		2.				
		3.				

Attachment No. 3		**Subject program from the first cycle of studies**			
1.	Title of the teaching subject	Logic Circuits and Digital Electronics			
2.	Code	ICS12E02			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	Year	1	semester	II
7	Course Workload Expressed in ECTS Credits	6			
8.	Teacher (in case of multiple teachers, the responsible instructor is designated)	Ass. Prof. Ile Dimitrievski, PhD			
9.	Language of instruction	English			
10.	Prerequisites for Attending and Passing the Course	Discrete Mathematics			
11.	Course Objectives	The main goal of the course is to introduce students to methods of			

	(Competencies) and Learning Outcomes:	analysis and design digital logic circuits and logic networks, both combinational and sequential circuits, registers and counters.			
12.	Detailed course content by chapters and units, with learning outcomes for each chapter	1. Introduction, Introduction to Numerical Systems, Numerical System Transformation, Binary Code, Boolean algebra, Boolean functions, logic circuits, families of logic circuits, basic logic circuits, minimization of Boolean functions with Karnaugh maps. 2. Combinational networks: design of combinational networks, adder, subtractor, combinational networks: multiplier, coder, decoder, multiplexer, demultiplexer. 3. Sequential networks: bistable circuits, rs flip flop, jk, d, t flip flop, counters: synchronous, asynchronous, binary, decade, structure and design, registers, memories. 4. HDL and Verilog description language of hardware, digital systems design. 5. Synthesis of sequential networks. Diagram of states, state table minimization. Registers, counters.			
13	Interconnection of Courses				
14.	Detailed Description of the Teaching and Working Methods for the Course	Lectures: 45 hours; Tutorials: 30 hours; self - study, projects, homework assigments: 105 hours = Total time of 180 hours			
15.	Total Available Time Allocation	6 ECTS credits x 30 hours/credit = 180 hours			
16.	Forms of Teaching Activities	16.1.	Lectures – theoretical instruction, hours	45	
		16.2.	Exercises (laboratory, auditory), seminars, teamwork: hours	30	
		16.3.	Practical work: hours	30	
17.	Other forms of activities	17.1.	Project assignments: hours	35	
		17.2.	Independent tasks: hours	35	
		17.3.	Home study – tasks	35	
18	Conditions for Signature	Students should ensure regular attendance at classes in accordance with the UIST study rulebook.			
19	Assessment Method				
	19.1.	Tests: Points		90	
	19.2.	Seminar paper/project, written and oral presentation: points		10	
	19.3.	Final exam: points		90	
20	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
21.	Method for monitoring the quality of teaching	Follow UIST Quality Assurance Procedures.			
22.	Literature				
	22.1.	Mandatory Literature			
		No.	Author	Title	Publisher	Year
		1.	Morris Mano, Michael Ciletti	Digital Design, 4th ed.	Prentice Hall	2006
		2.				

		3.				
	22.2.	Additional Literature				
		No.	Author	Title	Publisher	Year
		1.	Jr. Charles H. Roth, Larry L Kinney	Fundamentals of Logic Design, 6th ed.	CL Engineering	2009
		2.				
		3.				

Attachment No. 3		**Subject program from the first cycle of studies**			
1.	Title of the teaching subject	Signals and Systems			
2.	Code	ICS12E03			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject specific to faculty			
6.	Academic year / semester	Year	1	Semester	II
7	Course Workload Expressed in ECTS Credits	6			
8.	Teacher (in case of multiple teachers, the responsible instructor is designated)	Ass. Prof. Ile Dimitrievski, PhD			
9.	Language of instruction	English			
10.	Prerequisites for Attending and Passing the Course	Mathematics, Calculus			
11.	Course Objectives (Competencies) and Learning Outcomes:	The purpose of this course is to introduce students to the fundamentals of signals and systems which are basic to Digital Signal Processing. The main objective of this subject is to h elp the students to mathematically analyze different types of signals and their associated systems. 1.Various classifications of both Continuous time and Discrete time Signals and Systems. 2. Spectral analysis of Periodic and Aperiodic Signals using Fourier series. 3. Analysis and characterization of the CT system through Laplace transform. 4. Analysis and characterization of the DT system through Difference equation. 5. Analysis and characterization of the DT system through Z transform.			
12.	Detailed course content by chapters and units, with learning outcomes for each chapter	1. Classification of Signals: Continuous time signals - Discrete time signals – Periodic and Aperiodic signals – Even and odd signals – Energy and power signals –Deterministic and random signals –Complex exponential and Sinusoidal signals. Unit step, Unit ramp, Unit impulse – Representation of signals in			

		terms of unit impulse. Classification of Systems: Continuous time systems- Discrete time systems - Linear system – Time Invariant system – causal system – BIBO system – Systems with and without memory – LTI system. 2. Fourier series: Representation of Continuous time Periodic signals – Trigonometric and exponential-Symmetry conditions-Properties of Continuous time Fourier series – Parseval's relation for power signals –Frequency spectrum Fourier transform: Representation of Continuous time signals- Properties of Continuous time Fourier transform – Parseval's relation for energy signals – Frequency spectrum –Analysis of LTI system using Fourier methods. 3. System modeling: Solution of Differential equation with initial conditions-Zero state response and Zero input response– impulse response – Frequency response – Convolution – Analysis and characterization of LTI system using Laplace transform. 4. Representation of sequences – Discrete Time Fourier Transform (DTFT) – Discrete Fourier Transform (DFT) and its properties – Solution of linear constant coefficient difference equations with initial conditions-Zero state response and Zero input response–- impulse response – Convolution sum -Frequency response. 5. Unilateral &Bilateral Z transforms and its properties - Inverse Z transform: Power series expansion and Partial fraction methods - Analysis and characterization of DT system using Z transform-Realization of structures for DT systems -Direct form-I-Direct form II--Parallel-Cascade forms.		
13	Interconnection of Courses			
14.	Detailed Description of the Teaching and Working Methods for the Course	Lectures: 45 hours; Tutorials: 30 hours; self - study, projects, homework assigments: 105 hours = Total time of 180 hours.		
15.	Total Available Time Allocation	6 ECTS credits x 30 hours/credit = 180 hours		
16.	Forms of Teaching Activities	16.1.	Lectures – theoretical instruction, hours	40
		16.2.	Exercises (laboratory, auditory), seminars, teamwork: hours	30
		16.3.	Practical work: hours	30
17.	Other forms of activities	17.1.	Project assignments: hours	25
		17.2.	Independent tasks: hours	25
		17.3.	Home study – tasks	25
18	Conditions for Signature	Students should ensure regular attendance at classes in accordance with the UIST study rulebook.		
19	Assessment Method 80 + 15 + 5			
	19.1.	Tests: Points		90
	19.2.	Seminar paper/project, written and oral presentation: points		10
	19.3.	Final exam: points		90
20	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)

			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
21.	Method for monitoring the quality of teaching		Follow UIST Quality Assurance Procedures.		
22.	Literature				
	22.1.	Mandatory Literature			
		No.	Author	Title	Publisher	Year
		1.	Alan V Oppenheim, Ronald W. Schafer	Discrete Time Signal Processing	Pearson education, 2nd edition	2007
		2.	Simon Haykin and Barry Van Veen	Signals and Systems	John Wiley Sons Inc, 2nd Edition	2007
		3.	Alan V Oppenheim, Alan S. Willsky, S. Hamid Nawab	Signals & Systems	Prentice Hall, 2nd Edition	1997
	22.2.	Additional Literature				
		No.	Author	Title	Publisher	Year
		1.	John G. Proakis and Manolakis	Digital Signal Processing, Principles Algorithms an Applications	Pearson Education, 4th Edition	2007
		2.	Rodger E Ziemer, William H. Tranter, D. Ronald Fannin	Signals and Systems – continuous and Discrete	Pearson Education, 4th Edition	2009
		3.				

Elective No. 4	**First cycle study program**	
1.	Title of the course	Mathematics 2

2.	Code	ICS12E04			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	1st year/2nd semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Aneta Velkoska			
9.	Prerequisites for enrolling in the course	/			
10.	Objectives of the subject program (competencies): The aim of this course is to introduce the concepts of integrals, applications of integrals, series ordinary differential equations and various techniques for solving them, which are necessary in some of the courses in the coming semesters provided for in the study program.				
11.	Course content: ● Indefinite integral of basic functions of one variable, substitution method and partial integration method. ● Other integration techniques: trigonometric integrals, trigonometric shifts, integration of fractional-rational functions. ● Definite integral. Fundamental theorem of calculus. ● Determining the area of a surface under a given curve and between two curves using a definite integral; ● Calculation of arc length and volume of solids obtained by rotating curves. ● Rows, basic row properties, and special rows ● Series convergence tests ● Power series and functions ● Differential equations: solving equations with separable variables, linear differential equations of the first order, ● second- order linear differential equations .				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)	up to 50 points		5 (five) (F)	
		from 51 to 60 points		6 (six) (E)	

			from 61 to 70 points		7 (seven) (D)
			from 71 to 80 points		8 (eight) (C)
			from 81 to 90 points		9 (nine) (B)
			from 91 to 100 points		10 (ten) (A)
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				
	22.1	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	GB Thomas	THOMAS' CALCULUS, 12/E	Pearson Addison-Wesley	2010
		2.	H. Anton, I. Bivens, S. Davis	CALCULUS, 10/E	John Willey & Sons, Inc.	2012
		3.				
	22.2	Additional literature			
		Serial number	A second	Title	Publisher	Year
		1.	G. Strang, E. “Jed” Herman	CALCULUS Volume 2	XanEdu Publishing Inc.	2016
		2.				
		3.				

Attachment No. 3		**Subject program from the first cycle of studies**			
1.	Title of the teaching subject	Network Technology			
2.	Code	ICS14E01			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e., institute, department)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	Year	2	semester	IV
7	Course Workload Expressed in ECTS Credits	6			
8.	Teacher (in case of multiple teachers, the responsible instructor is designated)	Prof. Atanas Hristov, PhD			
9.	Language of instruction	English			

10.	Prerequisites for Attending and Passing the Course			
11.	Course Objectives (Competencies) and Learning Outcomes:	Course Objectives (Competencies): This course aims to enable students to learn fundamental networking technologies and to establish communication through computer networks. Students will gain an understanding of the importance of computer networks and the services they provide. They will also acquire knowledge and skills in the implementation and analysis of network protocols, which in turn leads to network design.		
12.	Detailed course content by chapters and units, with learning outcomes for each chapter	**Chapter 1: Introduction to Computer Networks** Basic concepts, types of networks, and services. Learning outcome: Understand fundamental networking concepts and terminology. **Chapter 2: Network Models and Protocols** OSI and TCP/IP models, protocol layering. Learning outcome: Explain network architectures and protocol functions. **Chapter 3: Application Layer** Web, HTTP, FTP, P2P applications, socket programming. Learning outcome: Understand application-layer communication and services. **Chapter 4: Transport Layer** TCP and UDP protocols. Learning outcome: Compare reliable and unreliable transport mechanisms. **Chapter 5: Network Layer** IP (IPv4/IPv6), routing algorithms, broadcast and multicast routing. Learning outcome: Explain packet forwarding, routing, and addressing. **Chapter 6: Link Layer and LANs** Error detection, multiple access, Ethernet, switches, VLANs. Learning outcome: Understand LAN technologies and link-layer operations. **Chapter 7: Mobility and Network Services** Mobile IP, DNS, DHCP, SNMP, ICMP, IGMP. Learning outcome: Explain mobility support and real-world network services.		
13	Interconnection of Courses			
14.	Detailed Description of the Teaching and Working Methods for the Course	This course is based on 45 hours of lectures, supplemented with 30 hours of exercises.		
15.	Total Available Time Allocation	6 ECTS credits x 30 hours/credit = 180 hours Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time 180 hours		
16.	Forms of Teaching Activities	16.1.	Lectures – theoretical instruction, hours	45
		16.2.	Exercises (laboratory, auditory), seminars, teamwork: hours	30
		16.3.	Practical work: hours	25
17.	Other forms of activities	17.1.	Project assignments: hours	20
		17.2.	Independent tasks: hours	30
		17.3.	Home study – tasks	30

18	Conditions for Signature		The student must ensure regular attendance of classes according to the regulations of UIST		
19	Assessment Method				
	19.1.	Tests: Points			45
	19.2.	Seminar paper/project, written and oral presentation: points			10
	19.3.	Final exam: points			45
20	Assessment criteria (points/grade)			up to 50 points	5 (five) (F)
				from 51 to 60 points	6 (six) (E)
				from 61 to 70 points	7 (seven) (D)
				from 71 to 80 points	8 (eight) (C)
				from 81 to 90 points	9 (nine) (B)
				from 91 to 100 points	10 (ten) (A)
21.	Method for monitoring the quality of teaching		Following the quality control procedures of UIST		
22.	Literature				
	22.1.	Mandatory Literature			
		No.	Author	Title	Publisher	Year
		1.	Andrew S. Tanenbaum, David J. Wetherall	Computer Networks, Global Edition	Pearson	2021
	22.2.	Additional Literature				
		No.	Author	Title	Publisher	Year
		1.	William Stallings	Data and Computer Communications: International Version	Pearson	2010

Elective No. 6	**Subject program from the first , second and third cycle of studies**			
1.	Title of the course	Graph Theory		
2.	Code	ICS14E02		
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences		
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences		
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit		
6.	Academic year / semester	second year/ fourth semester	7.	Number of ECTS credits: 6
8.	Teacher	Prof. Dr. Elena Hadzieva		

9.	Prerequisites for enrolling in the course		Discrete Mathematics		
10.	Objectives of the course program (competences): Students will be introduced to real problems that are modeled with graphs. They will be introduced to finite and infinite graphs, Isomorphism between graphs, different paths in graphs, especially Euler and Hamilton paths. They will be introduced to special types of graphs, simple graphs, trees, spanning trees (trees), planar graphs, subgraphs, complete graphs, bipartite graphs, digraphs, Kuratovsky graphs. They will be introduced to the concept of graph coloring, which will enable solving the four-color problem, which is used for coloring maps. They will be introduced to some graph algorithms and will practice exercises in Python on what they have learned.				
11.	Course content: Motivation for studying and applying graph trees. Finite and infinite graphs. Adjacency and vertex degree. Isomorphism. Subgraphs. Walk , path and circuit in a graph. Connected and unconnected graphs. Components of a graph. Euler path. Graph operations. Hamiltonian path and Hamiltonian closed path. Traveling salesman problem. Trees and their properties. Vertices and distances in trees. Spanning trees trees). Planar graphs. Different representations of planar graphs. Kurt a tovski graphs. Matrix representations of graphs. Coloring of graphs. Chromatic number. The four-color problem. Directed graphs (digraphs). Graph algorithms: Kruskal's algorithm, Prim's algorithm, Dijkstra's algorithm. Exercises in Python.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 10 +105				
	17.1.	Tests		80 points	
	17.2.	Homework/ project		10 points	
	17.3.	Activity and participation		10 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should attend classes regularly, according to the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				
	22.1	Required literature			
		Serial numb	A second	Title	Publisher	Year

		er				
		1.	Narsingh Deo	Graph Theory with Applications to Engineering and Computer Science	Dover Publications	2016
		2.				
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Robin J. Wilson	Introduction to Graph Theory, 4 th edition	Addison Wesley Longman Limited, Essex, England	1998
		2.	Shardav Bhatt	Graph Theory and Its Applications Using Python	Presentation on a Webinar, DOI :10.13140 /RG. 2.2.22213.68327	2020
		3.				

Elective No. 7	**Subject program from the first , second and third cycle of studies**				
1.	Title of the course	Economics of Business Processes and Transactions			
2.	Code	ICS14E03			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list			
6.	Academic year / semester	second year/forth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Jovanka Damoska Sekuloska			
9.	Prerequisites for enrolling in the course	There is none.			
10.	Objectives of the course program (competences) : The subject Economics of Business Processes and Transactions covers the identification and distribution of economic information about the company to internal and external users who use that information in the decision-making process. Accordingly, the aim of the subject is to familiarize students with the aspects of how the business information system is in the function of achieving the company's goals. To perceive the flow of physical resources, the movement of documents, financial flows, internal control, procedures and management of the control system within the framework of the traditional (manual) and computer-organized information system.				
11.	Course content: Economic activities and information in companies, Information systems from an economic perspective, Transaction processes, Ethical aspects and internal control, Revenue cycle, Cost cycle 1, Cost cycle 2, Conversion cycle (production), Financial reporting systems and management reporting, Data system management, Data modeling approaches, ERP systems, Electronic commerce system, Control and audit.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours;			

		Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17.	Grading method 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Seminar paper/project (presentation: written and oral)	15 points
	17.3.	Activity and participation	5 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

Literature

	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	James A. Hall	Accounting Information Systems, 10/ed	Cengage Learning	2019
		2.	Steven M. Bragg	Accounting Information Systems, 2/ed	Accounting Tools Inc.	2021
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Marshall B. Romney, Paul John Steinbart, Scott L. Summers and David A. Wood	Accounting Information Systems 15/ed	Pearson Education	2021
		2.				
		3.				

Election No. 8	**Subject program from the first , second and third cycle of studies**	
1.	Title of the course	Economics of Digital Marketing

2.	Code	ICS14E04			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	second year/ sixth semester	7.	Number of ECTS credits	6
8.	Teacher				
9.	Prerequisites for enrolling in the course	There is none.			

10. Objectives of the course program (competences) :
- To identify and understand the economic aspects of the concept of digital marketing
- To develop an understanding of the concepts of e-commerce and e-Marketing
- To develop an understanding of the concept of " integrated Digital Marketing Strategy " and alternative e-Marketing strategies
- To develop an understanding of different marketing mixes and related implications on the Internet
- Develop an understanding of the implications of Digital Marketing on customer relationships
- Measuring and evaluating the effectiveness of e-Marketing

11. Course content :
- Introduction to digital marketing
- Digital marketing strategy and performance measurement
- E-Marketing Planning
- E-Marketing Research
- Online shopping behavior
- Segmentation, targeting, positioning and differentiation strategies
- Online offer
- Online value
- Internet distribution
- Digital marketing communication tools
- Social media marketing
- Content marketing (Creating content in digital marketing)

12. Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.

13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17. Grading method 80 + 15 + 5

17.1.	Tests	80 points
17.2.	Seminar paper/project (presentation: written and oral)	15 points

	17.3.	Activity and participation				5 points
18.	Assessment criteria (points/grade)			up to 50 points		5 (five) (F)
				from 51 to 60 points		6 (six) (E)
				from 61 to 70 points		7 (seven) (D)
				from 71 to 80 points		8 (eight) (C)
				from 81 to 90 points		9 (nine) (B)
				from 91 to 100 points		10 (ten) (A)
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction		English, Macedonian			
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures			
	Literature					
	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Dave Chaffey and Fiona Ellis-Chadwick	Digital Marketing 7/ed	Pearson	2019
		2.	Simon Kingsnorth	Digital Marketing Strategy: an integrated approach to online marketing 3/ed	Kogan Page Limited	2022
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Simon Kingsnorth	The Digital Marketing Handbook: Deliver powerful digital campaigns	Kogan Page Limited	2022
		2.	Judy Strauss and Raymond Frost	E-Marketing 7/ed	Pearson	2014
		3.				

Elective No. 9	**Subject program from the first , second and third cycle of studies**				
1.	Title of the course	Algorithms and data structures 2			
2.	Code	CSE14M01			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	2nd year / 4th semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Ustiana Rechkoska Shikoska			
9.	Prerequisites for enrolling in the course	Object-Oriented Programming, Algorithms and Data Structures 1, Discrete Mathematics			
10.	Objectives of the subject program (competencies): The aim of the course is to study more complex abstract data structures and algorithms. It will				

	describe and explain how abstract data types are used, including graphs, binary trees and search trees . Students will be introduced to basic algorithms for working with graphs, binary trees and search trees, Hash tables, Hashing, Advanced algorithms, Runtime calculations, Evaluation, Simulations of algorithms .					
11.	Course content: Introduction to nonlinear structures, graphs - basic concepts and data structures for computer representation of graphs. Directed acyclic graphs, Minimum spanning tree (Prime Algorithm, standard and basic algorithms for working with graphs (topological sorting. Depth-first search (DFS) and breadth-first search (BFS) and others) laboratory exercises - for searching through graphs, Dijkstra Algorithm, Bellman - Ford Algorithm, Binary Heaps, Hashing, Advanced algorithms, practical laboratory exercises.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours		
16.	Other forms of activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		
		16.3.	Home learning	35 hours		
17.	Grading method 80 + 15 + 5					
	17.1.	Tests		80 points		
	17.2.	Seminar paper/project (presentation: written and oral)		15 points		
	17.3.	Activity and participation		5 points		
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)		
			from 51 to 60 points	6 (six) (E)		
			from 61 to 70 points	7 (seven) (D)		
			from 71 to 80 points	8 (eight) (C)		
			from 81 to 90 points	9 (nine) (B)		
			from 91 to 100 points	10 (ten) (A)		
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction		English, Macedonian			
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures			
	Literature					
	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Frank M. Carrano and Timothy Henry	Data Abstraction and Problem Solving with C++: Walls and Mirrors, 6th edition	Pearson International Edition	2013
		2.	Michael T. Goodrich Department of	Data Structures and Algorithms in Python	Wiley, Copyright ©	2013

			Computer Science University of California, Irvine Roberto Tamassia Department of Computer Science Brown University Michael H. Goldwasser Department of Mathematics and Computer Science Saint Louis University		2013 John Wiley & Sons, Inc	
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Robert Sedgewick and Kevin Wayne	Algorithms, 4th Edition	Addison-Wesley Professional	2011
		2.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman	Data Structures and Algorithms	Bell Laboratories, Murray Hill, New	2011
		3.				

Elective No. 10		**First cycle study program**			
1.	Title of the course	Communication Theory			
2.	Code	ICS14E06			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	Second year / fourth semester	7.	Number of ECTS credits	6
8.	Teacher	According to the decision of a competent authority at UINT			
9.	Prerequisites for enrolling in the course	Mathematics 1			
10.	Objectives of the subject program (competencies): The aim of the course is to provide a complete analysis of analog/digital transmission of information from transmitter to receiver. At the end of the course the student will be able to understand: 1. The concepts of analog and digital communication systems and the method of transmitting				

	analog and digital signals through them 2. The performance of the communication system in the presence of noise based on appropriate evaluation 3. Analog and digital modulation techniques used to ensure more efficient and secure transmission of information 4. Some basic properties from the field of information theory			
11.	Course content: 1. Communication systems and signals – Detailed overview of analog/digital components of a communication system. Definition of analog/digital data and analog/digital signals and their mutual conversion depending on the specifications of the communication system. 2. Communication System Performance – Definition of signal gain and loss during transmission through the system. Study of various devices used to improve communication throughout the system in relation to the type of signal being transmitted. Definition of various types of noise that degrade the signal in various parts of the communication system. Signal-to-noise ratio and its evaluation. Optimal utilization of bandwidth between multiple users. Different types of signal propagation and types of antennas in wireless environments. 3. Modulation/encoding techniques – Modulation techniques in terms of amplitude, frequency and phase when inputting analog data with an analog signal, Modulation-encoding techniques when inputting digital data with an analog signal. Encoding techniques when inputting analog data with a digital signal. Defining techniques for spreading the spectrum that provides increased security during signal transmission by reducing the signal-to-noise ratio. 4. Fundamentals of information theory – Definition of information, unit of information, entropy, uncertainty and information rate of communication, redundancy, relationship between system capacity and information contained in the message, Shannon's theorem.			
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.			
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homework - assignments	35 hours
17.	Grading method 80 + 15 +5			
	17.1.	Tests		80 points
	17.2.	Individual work/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			51 x to 60 points	6 (six) (E)
			61 x to 70 points	7 (seven) (D)

			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
22.	Literature				
	22.1.	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	Hancock JC	An Introduction to the Principles of Communication Theory	McGraw-Hill	1961
		2.	Simon Hay Kin	Communication Systems	Wiley, 4th Edition	2000
		3.	Singh.RP & Sapre. SD	Communication Systems: Analog & Digital	3rd Edition, TataMcGraw-Hill	2012
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Swartz	Information Transmission, Modulation and Noise	Mcgraw-Hill 4th Edition	1990
		2.	Taub & Schilling	Principals of Communication Systems	McGraw-Hill	1991
		3.				

Elective No. 11	**First cycle study program**

1.	Title of the course	Social Networks			
2.	Code	ICS14E07			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	2nd year/4th semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Aneta Velkoska			

9.	Prerequisites for enrolling in the course	/		
10.	Objectives of the subject program (competencies): • Students to acquire the basic terms of the new science of social networks. To recognize them on a theoretical, programmatic and cultural level. To understand that social networks have always been an inseparable part of social life, but with the emergence of information technologies they take the form of development platforms for online collaboration and fundamentally change the way we work, offering new tools that involve individuals, communities, colleagues, partners, on a global scale. To learn to use social networks in a way that is directed, to educate, to be inspired by them and to connect with other people from around the world. To learn to analyze existing social networks as well as to create their own.			
11.	Course content: • Social networks at the level of science: terminology; • Basic features of Social • Types of Social Networks; • Recognizing and working with existing social networks. • Stochastic models for creating a Social Network; • Unit 1: Introduction to social network analysis, graphical models, and node metrics. Illustration of various social network analysis tasks with real-world examples. Properties of social networks unique to these settings and potential biases due to them. • Social networks as graphs. • Random Graph Models for Creating Social Networks. • Social network analysis: graph classification, clustering of graphs in social networks, centrality measures, community detection and analysis in social networks. • Node-based metrics, ranking algorithms (Pagerank). • Finding overlapping communities, similarity between graph nodes, counting triangles in graphs, properties of graph adjacency. • Information diffusion in graphs: spread, epidemics. • Strategic Network Formation: Game Theoretical Models for Network Creation/User Behavior in Social Networks. • Dynamic social networks, applications and research trends. Social learning on networks. • Gephi graph visualization and exploration software .			
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.			
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours
17.	Grading method 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Seminar paper/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)

			from 71 to 80 points		8 (eight) (C)
			from 81 to 90 points		9 (nine) (B)
			from 91 to 100 points		10 (ten) (A)
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				
	22.1	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	S. Wasserman, K. Faust,	Social Network Analysis: Methods and Applications	Cambridge University Press	1994
		2.	J. Carrington, J. Scott, S. Wasserman	Models and Methods in Social Network Analysis	Cambridge University Press	2005
	22.2	Additional literature			
		Serial number	A second	Title	Publisher	Year
		1.	Jar-Der Luo, M. Boos, X. Fu	Social Network Analysis Interdisciplinary Approaches and Case Studies	CRC Press	2020
		2.				
		3.				

Elective No. 12		**First cycle study program**			
1.	Title of the course	Political Processes and Governance in the 21st Century			
2.	Code	ICS14E08			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	Second year / fourth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Dr. Goran Šibakovski			
9.	Prerequisites for enrolling in the course	There is none.			
10.	Course objectives (competencies): The course is based on the realization that management and services in the public sector can be improved through the use of modern technologies. In this course, students				

	will be introduced to the different concepts and models of remote management, government and infrastructure development, case studies and practices from different countries around the world. Students will acquire skills and knowledge about political processes and remote management, development of remote management models, as well as a better understanding of how government services are delivered through modern technology.			
11.	Course content: 1. Introduction to the subject. 2. The concept of governance in the 21st century. Difference between government and remote governance. Remote government as an information system. Benefits of remote government. Development cycle of remote government. Evolution, scope and content of remote governance. 3. Governance models in the 21st century. Evolution in remote governance models. Characteristics of the models. Towards good governance through a remote governance model. 4. Development of remote government infrastructure. Network infrastructure. Data centers. Remote government architecture. Legal, institutional, human and technological infrastructure readiness. 5. Remote government security. Remote government security challenges and approaches. Security management model. Security standards. 6. Design and implementation of a strategy for remote government and governance in the 21st century. Remote governance: Challenges in implementation. 7. Remote government and public policies. Creating public policies. Participation and services in the public sector in synergy with modern technologies. 8. National data repositories. Census data. Other areas of public data storage. 9. Trends in remote government in the world. Comparative aspects. 10. Issues, need and evolution of remote management. 11. Challenges in 21st Century Governance in Developing Countries. Case Studies and Practices. 12. The state of remote management and government in the Republic of Macedonia. Challenges and trends. 13. Global trends and challenges in management in the 21st century.			
12.	Learning methods: Lectures and theoretical teaching, exercises, independent seminar work, teamwork in groups, project and independent assignments, homework, consultations.			
13.	Total available fund on time	6 EXT x 30 hours/credit = 180 hours		
14.	Allocation of available time	45+30+35+35+35 = 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homework - assignments	35 hours
17.	Method of assessment			
	17.1.	Tests		80 points
	17.2.	Individual work/project (presentation: written and oral)		10 points
	17.3.	Activity and participation		10 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			51 x to 60 points	6 (six) (E)
			61 x to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)

			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Regular attendance at classes in accordance with UINT regulations		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Self-evaluation and mechanisms for monitoring the quality of teaching at UINT		
22.	Literature				
	22.1.	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	Trotta, Anthony	Advances in E-Governance: Theory and Application of Technological Initiatives	Taylor & Francis	2018
		2.				
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	CSR Prabhu	E-governance: Concepts and Case Studies	PHI Learning	2012
		2.	Ming, Anthony, Omer Awan & Naveed Somani	e-Governance in Small States	Commonwealth Secretariat	2013
		3.				

Elective No. 13	**First cycle study program**

1.	Title of the course	Legal Aspects of Computer Crime			
2.	Code	ICS14E09			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	2nd year/4th semester	7.	Number of ECTS credits	6
8.	Teacher	Dr. Ivan Bimbilovski			
9.	Prerequisites for enrolling in the course	Passed state matriculation examination			

10.	Objectives of the subject program (competencies): At the end of the semester, students will be able to: • To recognize and classify different types of cybercrime and technologies used in committing it; • To understand and recognize the behavior and role of offenders and their victims in cyberspace and to use basic web tools to detect potentially risky situations online; • To assess the impact that cybercrime has on the state, the economy, individuals and the community; • To assess the effectiveness of measures to combat computer crime and cyberwarfare (e.g. the Budapest Convention).				
11.	Course content: The course program addresses topics and problems such as: crimes related to computer abuse; crimes related to data protection; crimes related to property violations; crimes related to communications violations; crimes related to Internet content; crimes against the person; cyber-evidence and forensics; cyber-terrorism; cyber-warfare and cyber-espionage; the Deep Web ; cybersecurity policies, measures and operations; etc.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English , Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		

Literature

	22.1	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	Matthew Richardson	Cyber Crime: Law and Practice, 2nd Edition	Wildy, Simmonds and Hill Publishing	2019

		2.	Catherine D. Marcum	Cybercrime, 3rd Edition	Aspen Publishing	2019
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Joshua B. Hill, Nancy E. Marion	Introduction to Cybercrime: Computer Crimes, Laws, and Policing in the 21st Century	Praeger	2016
		2.	Janine Kremling, Amanda M Sharp Parker	Cyberspace, Cybersecurity, and Cybercrime	Sage Publications, Inc.	2017

Elective No. 14	**Subject program from the first , second and third cycle of studies**			
1.	Title of the course	Introduction to Robotics		
2.	Code	ICS14E10		
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences		
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences		
5.	Degree (first, second, third cycle)	Second cycle		
6.	Academic year / semester	2nd year/ 4th semester	7. Number of ECTS credits	6
8.	Teacher	Dr. Anis Sefidanoski		
9.	Prerequisites for enrolling in the course			
10.	Objectives of the subject program (competencies): The objectives of this course program are to master the procedures for the design and construction of single-actuated robotic systems for process automation and solving simple tasks.			
11.	Course content: Historical overview of robotics, basic concepts and elements of robots, classification and application of robots. Construction and characteristics of the basic modules of a robot. Transformation of coordinate systems in robots. Kinematics of rotational motion, Denavit-Hartenberg notation, Euler angles, Euler parameters, quaternions; direct kinematics, transformation between two adjacent coordinate systems; inverse kinematics. Dynamics of translational motion of a rigid body, forces, moments, dynamics of rotational motion of a rigid body, Newton-Euler equations of a robot, Lagrangian dynamics of a robot. Concepts of open and closed control systems of robots, basic control structures, actuators and sensors in robot control systems. Modeling and simulation of robots using virtual environments.			
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by the study of a specific case, consultations with the subject professor and the preparation of a project.			
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time	Lectures: 45 hours; Consultations: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		

15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Consultations	30 hours
16.	Other forms of activities	16.1.	Project development	35 hours
		16.2.	Case study	35 hours
		16.3.	Home learning	35 hours

17.	Grading method 50 + 25 + 20 + 5		
	17.1.	Final exam	50 points
	17.2.	Colloquium	25 points
	17.2.	Project (presentation: written and oral)	20 points
	17.3.	Activity and participation	5 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English , Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

Literature

Required literature

Serial number	A second	Title	Publisher	Year
1.	Saaed B. Niku	Introduction to Robotics - Analysis, Control Applications	Wiley; 3rd edition	2020
2.				
3.				

Additional literature

Serial number	A second	Title	Publisher	Year
1.	John J. Craig	Introduction to Robotics	Pearson, Global Edition	2021
2.				

		3.				

Elective No. 15	**Subject program from the first , second and third cycle of studies**					
1.	Title of the course	Computer Organization and Architecture				
2.	Code	ICS15E01				
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences				
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle – mandatory subject				
6.	Academic year / semester	3rd year/5th semester	7.	Number of ECTS credits	6	
8.	Teacher	Assoc. Prof. Atanas Hristov				
9.	Prerequisites for enrolling in the course	Discrete mathematics				
10.	Objectives of the subject program (competencies): After completing the training, students will be able to: solve problems with number systems, Boolean algebra and computer arithmetic; learn the basics of computer organization and its basic elements such as: Memory, processor, external memory, cache memory. They will learn the basics of computer instructions, as well as understanding Pipelining in instructions; the basics of superscalar architecture; multi-core architecture and parallelism at a basic level. Additionally, students will have a clear understanding of the differences between low-level and high-level programming, their advantages and disadvantages, and demonstrate knowledge of the basic relationships between elements in computer architecture. They will learn to write programs in Assembler and use them in programs written in high-level languages. They will learn to install and use Linux on a physical and virtual computer machine.					
11.	Course content: Number systems. Introduction and evolution of computer systems. Fundamentals of cache memory, internal memory, input/output systems, computer arithmetic, instruction set: addressing and formats, processor structure and functions - Pipelining . multi-core architecture, instruction-level parallelism and superscalar architecture; Intel x 86. Control unit basics. Computer architecture and programming, introduction to NASM , Assembly basics, bit operations, subroutines.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours				
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours		
16.	Other forms of activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		

		16.3.	Home learning	35 hours
17.	Grading method 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Seminar paper/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction		English, Macedonian	
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures	

Literature

Required literature

	Serial number	A second	Title	Publisher	Year
22.1	1.	William Stallings	Computer Organization & Architecture	Prentice Hall	2019
	2.	A. Carter	PC Assembly Language	Creative Commons Attribution-4.0 International License	2004
	3.	Hennessy & Patterson	Computer Architecture: A Quantitative Approach, 3rd ed	Morgan Kaufmann	2007

Additional literature

	Serial number	A second	Title	Publisher	Year
22.2	1.	JW Lockwood	The art of assembly programming,	O'Reilly	2010
	2.	Patterson, Hennessy	Computer organization and design	Educational work, (Morgan Kaufmann)	2011
	3.				

Elective No. 16		**First cycle study program**			
1.	Title of the course	Computer Graphics			
2.	Code	ICS15E02			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	2nd year/ 3rd semester 3rd year/ 5th semester	7.	Number of ECTS credits	6 (six)
8.	Teacher	Dr. Aleksandar Karadimche			
9.	Prerequisites for enrolling in the course	Object-oriented programming , Mathematics 1			
10.	Objectives of the subject program (competencies): Introduction to theoretical foundations and concepts of 2D and 3D computer graphics, geometric modeling and basic transformations. Upon completion of the course, the student is expected to demonstrate knowledge of the theoretical foundations and concepts of 2D and 3D computer graphics, to use the OpenGL library and graphics software packages for practical implementation of computer graphics problems. Additionally, students will acquire the skills to fully understand what WebGL really is and how it really works.				
11.	Course content: Historical development and division of computer graphics. Elements of computer graphics. Hardware and software for geometric modeling. Two-dimensional graphics. Basic routines for drawing shapes. Matrix representation of objects and transformations. Geometric representation of points and lines; Homogeneous coordinates; Point transformation, translation, rotation, scaling, reflection; Fractal geometry; shading; Ray Tracing ; GLUT Basics ; OpenGL Geometry, OpenGL Lighting and Materials, Implementation of two-dimensional graphics. Three-dimensional graphics (3D) . Introduction to WebGL , 3D graphics with WebGL , Application of computer graphics.				
12.	Learning methods: This course is based on 45 hours of lectures and 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homework - assignments	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)	up to 50 points		5 (five) (F)	
		51 x to 60 points		6 (six) (E)	
		61 x to 70 points		7 (seven) (D)	

				from 71 to 80 points	8 (eight) (C)	
				from 81 to 90 points	9 (nine) (B)	
				from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam			Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction			English, Macedonian		
21.	Method of monitoring the quality of teaching			Monitoring UINT control procedures		
22.	Literature					
	22.1.	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	David J. Eck	Introduction to Computer Graphics	Hobart and William Smith Colleges Geneva, NY Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License.	2021
		2.	John Kessenich, Graham Sellers, and Dave Shreiner	The OpenGL® Programming Guide (the "Red Book")	Addison-Wesley, 9th Edition	2016
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Lee Stemkoski and James Cona	Developing Graphics Frameworks with Java and OpenGL	CRC Press, 1st edition	2022
		2.	Steve Marschner and Peter Shirley	Fundamentals of computer graphics	CRC Press, 5th edition.	2021
		3.				

Elective No. 17	**First cycle study program**	
1.	Title of the course	Linear Algebra
2.	Code	ICS15E03
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study program (unit,	University of Information Sciences and Technologies "St.

	i.e. institute, department, division)	Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle – elective course from the study program				
6.	Academic year / semester	third year/ fifth semester	7.	Number of ECTS credits	6	
8.	Teacher	Prof. Dr. Elena Hadzieva				
9.	Prerequisites for enrolling in the course	Mathematics 1				
10.	Objectives of the subject program (competencies): The first part of this course provides computer science students with an introduction to vectors, matrices, linear transformations, and vector spaces and subspaces, as well as their application in the field of computer science, in computational problems. The second part of this course introduces students to ordinary differential equations, various techniques for solving them, and their applications.					
11.	Course content: Systems of linear equations. Matrices and operations with them. Matrix equations. Elementary matrices. Determinants. Properties of determinants. Vectors. Scalar and vector product. Vector spaces. Vector subspaces. Linear independence. Linearly independent and linearly dependent vectors. Basis and dimension. Linear transformations: rotation, translation, projection. Matrix representation of linear transformations. Characteristic polynomial of a matrix. Eigenvalues, eigenvectors and eigenspace of a matrix.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours				
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours		
16.	Other forms of activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		
		16.3.	Home learning	35 hours		
17.	Grading method 80 + 10 +105					
	17.1.	Tests	80 points			
	17.2.	Homework	10 points			
	17.3.	Activity and participation	10 points			
18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)			
		from 51 to 60 points	6 (six) (E)			
		from 61 to 70 points	7 (seven) (D)			
		from 71 to 80 points	8 (eight) (C)			
		from 81 to 90 points	9 (nine) (B)			
		from 91 to 100 points	10 (ten) (A)			
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.				
20.	Language of instruction	English, Macedonian				
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures				
	Literature					
	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year

		1.	Steven Leon	Linear Algebra with Application, 8th Edition	Pearson Education, Inc.	2010
		2.				
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	SW Goode, SA Annin	Differential equations and linear algebra	Pearson Prentice Hall	2007
		2.				
		3.				

Elective No. 18	**First cycle study program**				
1.	Title of the course	Computer Simulations in Physics			
2.	Code	ICS15E04			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective course from the study program			
6.	Academic year / semester	third year/ fifth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Dr. Rasim Salkoski			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): Upon completion of this course, students should: • Gain an understanding of the basic principles and concepts through simulations that govern classical mechanics (kinematics and dynamics) and gain a working knowledge of their application to practical problems, • Demonstrate knowledge and understanding of: scientific phenomena, facts, laws, definitions, concepts, theories, scientific vocabulary, terminology, conventions, scientific quantities and their determination, objective-to-final estimates, scientific and technological applications, as well as their social, economic and environmental consequences, • Demonstrate an understanding of physical reality through estimation, approximation and mathematical modeling, and understand how a small number of fundamental physical principles underlie a vast diversity of interconnected natural phenomena, • Think critically: naming something knowing that it is not something, • Manage precise and complex concepts to construct logical arguments, • Obtain appropriate information from a variety of sources and be able to communicate (both orally and in writing) about scientific information in a clear, concise and logical way.				
11.	Course content: This is an introductory physics calculus course with an emphasis on the fundamental concepts of Computer Simulation of Newtonian Mechanics and covers the following topics: • Physical Quantities and Vectors, • Computer Simulation of Kinematics in One and Two Dimensions, • Computer Simulation of Newton's Laws of Motion, • Applications of Newton's Laws, • Computer Simulation of Work and Kinetic Energy, • Computer Simulation of Potential Energy and Conservation of Energy, • Computer Simulation of Momentum and Impulse and Rotation of a Rigid Body, • Elasticity and Fluids, • Computer Simulation of Newtonian Theory of Gravitation, • Computer Simulation of Oscillations				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total			

		time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17.	Grading method 80 + 10 +105		
	17.1.	Tests	80 points
	17.2.	Homework	10 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

Literature

Required literature

	Serial number	A second	Title	Publisher	Year
22.1	1.	Randall Knight	Physics for Scientists and Engineers: A Strategic Approach	Pearson	2008
	2.	Martin Oliver Steinhauser	Computer Simulation in Physics and Engineering	Walter de Gruyter GmbH, Berlin	2013
	3.				

Additional literature

	Serial number	A second	Title	Publisher	Year
22.2	1.	Serway and Jewett	Physics for Scientists and Engineers	Brooks/Cole	2008
	2.	Freedman and Young	Sears and Zemansky's University Physics	Pearson	2010
	3.				

Elective No. 19	**First cycle study program**	
1.	Title of the course	Human-Computer Interaction
2.	Code	ICS15E05

3.	Study program / Faculty		Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)		University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)		First cycle – elective course from the study program			
6.	Academic year / semester		third year/ fifth semester	7.	Number of ECTS credits	6
8.	Teacher		Assoc. Dr. Rasim Salkoski			
9.	Prerequisites for enrolling in the course					
10.	Objectives of the subject program (competencies): After completing this course, students will be able to produce usable and secure systems, as well as functional systems, keeping the user in mind. Students will understand the factors that characterize the use of technology by people, will develop tools and techniques for building appropriate systems, which will achieve efficient, effective and safe interaction.					
11.	Course content: 1. What is interaction design? 2. Understanding and conceptualizing interaction 3. Cognitive aspects 4. Social interaction 5. Emotional interaction 6. Interfaces 7. Data collection 8. Data analysis, interpretation and presentation 9. The interactive design process 10. Defining requirements 11. Design, prototyping and construction 12. Interactive design in practice 13. Introduction to evaluation 14. Evaluation: examination, analysis and models I 15. Evaluation: examination, analysis and models II.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching		45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork		30 hours	
16.	Other forms of activities	16.1.	Project tasks		35 hours	
		16.2.	Independent tasks		35 hours	
		16.3.	Home learning		35 hours	
17.	Grading method 80 + 10 +105					
	17.1.	Tests			80 points	
	17.2.	Homework			10 points	
	17.3.	Activity and participation			10 points	
18.	Assessment criteria (points/grade)		up to 50 points		5 (five) (F)	
			from 51 to 60 points		6 (six) (E)	
			from 61 to 70 points		7 (seven) (D)	
			from 71 to 80 points		8 (eight) (C)	
			from 81 to 90 points		9 (nine) (B)	
			from 91 to 100 points		10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction		English, Macedonian			
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures			
	Literature					
	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	H Sharp, Y. Rogers, &	Interaction design:	Wiley	2015

			J Preece	Beyond human-computer interaction. Revised 4th edition.		
		2.				
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Ben Shneiderman & Catherine Plaisant	Designing the User Interface. 5th edition.	Pearson	2006
		2.	A Dix, JE Finley, GD Abowd, R Beale	Human-computer interaction. 3rd edition.	Pearson	2004
		3.				

Elective No. 20	**Subject program from the first , second and third cycle of studies**

1.	Title of the course	Modeling and Simulations				
2.	Code	ICS15E06				
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences				
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle – mandatory subject				
6.	Academic year / semester	3rd year / 5th semester	7.	Number of ECTS credits	6	
8.	Teacher	Assoc. Dr. Ljubinka Sandžakoska				
9.	Prerequisites for enrolling in the course	there is no				
10.	Objectives of the subject program (competencies): This course provides students with a sufficient understanding of contemporary concepts and approaches in modeling and simulating real-world systems. Additionally, this course aims to help students identify the opportunities and potential of using models, as well as equip them with the skills to develop simulations - as a support for improving systems and processes.					
11.	Course content: 1. Principles of Modeling and Simulation. 2. Theoretical Underpinnings. 3. Practical Domains (Practical Domains). ● The first part covers a brief history of the processes: modeling and simulation, followed by an overview of numerous functions. Furthermore, the advantages and disadvantages of using models in problem solving will be learned. And at the end of the first part, two main reasons for using modeling and simulation will be illustrated, through the study of a specific problem related to the use, thus gaining insight into the complex concepts. ● The second part of the program, *Theoretical Foundations*, examines various modeling techniques and introduces students to two important simulation concepts: ***discrete event simulation*** and ***continuous system simulation*** . This part details the two basic methods and also covers the importance of verification and validation. ● The third part of this course, which covers *practical domains* , delves into specific topics related to **business** , **medicine** , and **social sciences** . Furthermore, the challenges of modeling and simulation are covered, along with advanced applied modeling and simulation principles such as representation techniques, integration into application infrastructure, and new technologies.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by the study of a specific case, consultations with the subject professor and the preparation of a project.					
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Allocation of available time	Lectures: 45 hours; Consultations: 30 hours;				

			Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Consultations	30 hours
16.	Other forms of activities	16.1.	Project development	35 hours
		16.2.	Case study	35 hours
		16.3.	Home learning	35 hours
17.	Grading method 50 + 25 + 20 + 5			
	17.1.	Final exam		50 points
	17.2.	Colloquium		25 points
	17.2.	Project (presentation: written and oral)		20 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction		English, Macedonian	
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures	

Literature

Required literature

	Serial number	A second	Title	Publisher	Year
22.1	1.	John A. Sokolowski, Catherine M. Banks	Principles of Modeling and Simulation: A Multidisciplinary Approach, 1st Edition	Wiley	2009
	2.	Giuseppe Ciaburro	Hands-On Simulation Modeling with Python: Develop simulation models to help you get accurate results and enhance the decision-making process, 2nd Edition	Packt Publishing	2023
	3.				

Additional literature

	Serial number	A second	Title	Publisher	Year
22.2	1.	Jonah O'Kelly	Computer Simulation: Advanced Techniques, Methods and Applications	Willford Press	2019
	2.				

		3.				

Elective No. 21		**First cycle study program**			
1.	Title of the course	Digital Signal Processing			
2.	Code	ICS15E07			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	third year / fifth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Ile Dimitrievski			
9.	Prerequisites for enrolling in the course	Signals and Systems			
10.	Objectives of the subject program (competencies): At the end of the course, the student will be able to understand: 1. The structures of signals and systems in discrete time 2. Implementation of the Fast Fourier Transform, frequency response and design of filters with finite and infinite impulse response 3. Effect of words with limited length 4. DSP processor – TMS320C5X				
11.	Course content: 1. Overview of Discrete Time Signals and Systems – Overview of Signals and Systems, Discrete Fourier Transform, Fast Fourier Transform using time and frequency decimation algorithm, Inverse Discrete Fourier Transform, Fast Fourier Transform using time and frequency decimation algorithm, Application, Circular Convolution, MATLAB Programming for DFT and BFT 2. Design and Implementation of Infinite Impulse Response Filter – Design of Analog Filter Using Butterworth and Chebyshev Approximation – Design of Digital Filter with Infinite Impulse Response from Analog Filter Using Impulse Invariant Technique and Bilinear Transform, MATLAB Programming for Infinite Impulse Response Filters 3. Design and Implementation of Finite Impulse Response Filter – Linear Phase Response – Finite Impulse Response Filter Design Techniques – Fourier Series Method and Frequency Sampling Methods – Design of a linear phase filter with finite impulse response using windows: rectangular, Hanning and Hamming window - MATLAB programming for filters with finite impulse response 4. Effects of finite-length words in digital filters – Fixed-point arithmetic, the effect of quantization of input data due to finite word length, rounding of the product – need for scaling – Zero input limiting cyclic oscillations – Limiting cyclic oscillations due to sum overflow -Implementation of lookup table to avoid multiplication 5. Processor Fundamentals – DSP Features processor – DSP processor package (architecture) – Fixed-point and floating-point DSP processors – DSP processor memory architecture (Von Neumann – Harvard) – Addressing modes – Channeling – TMS 320 family of DPS processors (C 5 x architecture)				

12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homework - assignments	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
22.	Literature				
	22.1.	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	John G. Proakis and	Digital Signal	Pearson	2007

			Dimitris C. Manolakis	Processing Principles, Algorithms and Applications	Education, Fourth Edition,	
		2.	Alan V Oppenheim, Ronald W. Schafer	Discrete Time Signal Processing	Pearson Education, 2nd edition	2007
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Hayes.MH	Digital Signal Processing	Tata McGraw Hill, NewDelhi, Edition	2009

Elective No. 22		**First cycle study program**			
1.	Title of the course	Optical and Wired Networks			
2.	Code	ICS15E08			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	Third year/ Fifth semester	7.	Number of ECTS credits	6
8.	Teacher	Dr. Jovan Karmachoski and Ile Dimitrevski			
9.	Prerequisites for enrolling in the course	Passed exam: Internet technologies			
10.	Objectives of the subject program (competencies): The student will gain knowledge of wired network technologies such as optical networks, wired networks and hybrid optical-wired networks. They will also gain knowledge of wired end-user access technologies such as xDSL , FTTx and DOCSIS .				
11.	Course content: • Electromagnetic spectrum, properties of light, dual nature of light, concept of photon, wave models, characteristics of light waves, concept of information, general communication systems, evolution of basic optical communication systems, advantages and disadvantages of optical networks, transmission window, transmission through optical fiber, law of reflection and refraction, light rays and light waves, reflection of light from an optical surface, refraction of light from an optical interface, numerical aperture, optical fiber, type of fiber • Optical fiber characteristics and parameters for describing optical fiber performance (attenuation, dispersion and noise). Optical fiber losses – Gain, Material absorption losses,				

	linear and nonlinear scattering losses, fiber bending losses, dispersion, intermodal dispersion, intramodal dispersion, total optical dispersion and polarization, fibers with shifted dispersion and straightened dispersion, gain and dispersion limitations in fibers. • Optical materials, couplers and connectors – Optical fiber preparation: liquid phase technique, vapor deposition technique, connector principles, fiber end preparation, splicing, connectors • Optical sources and detectors – Sources: Basic principles of surface emitting LED and edge emitting LED, materials used, structure, internal quantum efficiency and characteristics, LASER diode, materials used, structure, internal quantum efficiency and characteristics, principles of operation and characteristics of a distributed laser with a return channel, Detectors: PIN photodiode, materials used, principle of operation and characteristics, avalanche photodiode, materials used, principle of operation and characteristics • Fiber Optic Measurements – Test Equipment, OTDR, Gain Measurement Setup, Dispersion, NA and Eye Design • WDM architectures. SDH and next generation SDH networks, 1/10/40/100 Gb Ethernet , Carrier Ethernet . MPLS / GMPLS . OTN – standard. OTN Framework. WDM Network Design. WDM FTTH – optics to the home. Passive optical networks. NG - PON , WDM - PON . • Hybrid fiber-optic networks (HFC). • Passive optical networks (PON , EPON , GPON , GEPON). FTTx . • xDSL technologies, architecture and multiplexing. Service solutions for user access via xDSL technology. • DOCSIS .			
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.			
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	40 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homework - assignments	35 hours
17.	Grading method 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Individual work/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)

			from 61 to 70 points	7 (seven) (D)		
			from 71 to 80 points	8 (eight) (C)		
			from 81 to 90 points	9 (nine) (B)		
			from 91 to 100 points	10 (ten) (A)		
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction		English, Macedonian			
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures			
22.	Literature					
	22.1.	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Joseph C. Palais	Fiber Optic Communications (5th Edition)	Prentice Hall	2004
		2.	A.Shami, M.Maier, C.Assi	Broadband Access Networks, Technologies and Deployments	Springer Science	2009
		3.	John M. Senior	Optical Fiber Communication Principles & Practice	PHI, 3rd Edition	2008
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Pierre Lecoy	Fiber Optic Communications	John Wiley & Sons	2008
		2.	Gerd Keiser	Optical Fiber Communication	McGraw Hill	2010
		3.				

Elective No. 23	**First cycle study program**

1.	Title of the course	Musical Programming
2.	Code	ICS15E09
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences

5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	3rd year/5th semester	7.	Number of ECTS credits	6
8.	Teacher	Full Professor Dr. Ustiana Rechkoska-Shikoska			
9.	Prerequisites for enrolling in the course	Passed state matriculation examination			
10.	Objectives of the subject program (competencies): Introducing the student to the basic concepts of working with multimedia data, the ways of modeling and implementing them and manipulating them. The student will be able to model multimedia data, with a focus on music as multimedia content, will know how to practically apply content-based search multimedia data in the direction of music programming, and will gain introductory knowledge of creating applications based on multimedia, musical content.				
11.	Course content: – Introduction – Multimedia data organization – Digitization techniques – Data models – Distributed Sensor Multimedia Systems – Designing multimedia applications – Acoustics and psychoacoustics – Cognitive science – Mathematics and programming – Digital signal processing – Computer programming – User interface design – Music theory – Musical composition				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests	80 points		
	17.2.	Seminar paper/project (presentation: written and oral)	15 points		
	17.3.	Activity and participation	5 points		
18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)		
		from 51 to 60 points	6 (six) (E)		
		from 61 to 70 points	7 (seven) (D)		
		from 71 to 80 points	8 (eight) (C)		
		from 81 to 90 points	9 (nine) (B)		

			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				
	22.1	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	Ajay Kapur, Perry Cook, Spencer Salazar, and Ge Wang	Programming for Musicians and Digital Artists	eBook, ISBN 9781617291708	201 4
			Borko Furht	Multimedia Systems and Applications	Springer	2016
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
			Andrew R. Brown, Bill Manaris	Making Music with Computers: Creative Programming in Python, 1 st Edition	Chapman & Hall/CRC Textbooks in Computing	2014

Elective No. 24	**First cycle study program**				
1.	Title of the course	Discrete Mathematics			
2.	Code	ICS15E10			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	1st year/1st semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Aneta Velkoska			
9.	Prerequisites for enrolling in the course	/			
10.	Objectives of the subject program (competencies): The aim of the course is to introduce the student to the theoretical foundations of random processes that lie in martingales and martingale convergence theorems, then to become familiar with the basic processes, Markov, Poisson processes that find a wide application in various fields.				

11.	Course content: ● Propositions, operations with propositions, propositional formulas and logical laws ● Mathematical induction ● Differential (Recursive) Equations ● Order of magnitude ● Graphs: Presentation and Properties ● Isomorphism and connectedness. ● Euler's and Hamilton's path, shortest path ● Coloring and planarity of graphs. ● Trees: Basic concepts of trees and rootstocks ● Application of Rooted Trees and searching in rooted trees. ● Spanning trees (easiest trees and search trees)				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English, Macedonian, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				

		Required literature				
		Serial number	A second	Title	Publisher	Year
	22.1	1.	Kenneth H. Rosen	Discrete Mathematics and Its Application (7th ed.)	McGraw-Hill	2013
		2.				

	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	S. Lipschutz and M. Lipson	Discrete Mathematics (3rd ed.)	Schaum	2007
		2.				
		3.				

Elective No. 25		**First cycle study program**			
1.	Title of the course	Control Theory			
2.	Code	ICS15E11			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle - elective subject from the unit			
6.	Academic year / semester	Third year / fifth semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Ninoslav Marina			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): Students will be introduced to creating system controllers based on their mathematical model. In this course, they will be introduced to using the MATLAB tool, as well as the SIMULINK tool when creating and sketching the mathematical model. Interactive controller design with the Root - Locus method, as well as PI , PD , PID , Lead , Lag and Lead - Lag controllers.				
11.	Course content: Introduction to MATLAB . Introduction to Laplace and Inverse Laplace Transform. Transfer function and state space model. Creating a mathematical model of electrical circuits, translational and rotational systems. Basic mathematical models of first and second order systems. Stationary errors. Stability of systems. Designing PID and Lead - Lag compensator. Using SIMULINK to sketch the mathematical model of the system, as well as its compensator.				
12.	Learning methods:				
13.	Total available fund on time				
14.	Allocation of available time				
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.		
16.	Other forms of activities	16.1.	Project tasks		
		16.2.	Independent tasks		

		16.3.	Homework - assignments	
17.	Method of assessment			
	17.1.	Tests		
	17.2.	Individual work/project (presentation: written and oral)		
	17.3.	Activity and participation		
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			51 x to 60 points	6 (six) (E)
			61 x to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		Students should attend classes regularly.	
20.	Language of instruction		English, Macedonian	
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures	

22.	Literature					
	22.1.	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Norman Nise	Control Systems Engineering	Wiley & Sons	2011
		2.				
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Farid Golnaraghi	Automatic Control Systems	Wiley	2009
		2.				

Elective No. 26		**First cycle study program**
1.	Title of the course	Multimedia Information Systems
2.	Code	ICS15E12
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences

5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	3rd year / 5th semester		Number of ECTS credits	6
8.	Teacher	Assoc. Dr. Anis Sefidanoski			
9.	Prerequisites for enrolling in the course	Introduction to multimedia data processing,			
10.	Objectives of the subject program (competencies): Introducing the student to the basic concepts of working with multimedia data, ways of modeling and implementing and manipulating them. The student will be able to model multimedia data, will know how to practically applies content-based search to multimedia data, and will acquire introductory knowledge for creating applications based on multimedia contents.				
11.	Course content: Introduction. Multimedia data organization. Multimedia standards. Techniques for digitization. Data models and access. Representation and processing of multimedia data. Compression of multimedia data (text, image, video and audio). Representation, description and management of multimedia content. MPEG – 7 multimedia description schema. Content-based search and filtering of multimedia data. Visual descriptors. Descriptors for searching for multimedia content by color. Multimedia search descriptors content by texture. Descriptors for searching multimedia content by shape (regions and contours). Descriptors for searching 3D objects and their application. Descriptors for description and search of multimedia content according to movement. Techniques for indexing and searching audio data. Distributed Sensor multimedia systems. Aspects of multimedia communications. Transmission of multimedia information, protocols, interfaces and coding standards and formats for data exchange. Connection with MPEG-4. Parameters for assessing quality of service (QoS) in multimedia systems and communications. Media synchronization and real-time display support. Interactive multimedia environments. Multimedia systems in cloud environments (processing, transmission and quality of service). Review of designing multimedia applications. Application of multimedia systems in medicine and education. Other topics.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homework - assignments	35 hours	
17.	Method of assessment				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	

18.	Assessment criteria (points/grade)			up to 50 points	5 (five) (F)	
				51 x to 60 points	6 (six) (E)	
				61 x to 70 points	7 (seven) (D)	
				from 71 to 80 points	8 (eight) (C)	
				from 81 to 90 points	9 (nine) (B)	
				from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attending classes according to the UINT regulations			
20.	Language of instruction		English, Macedonian			
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures			
22.	Literature					
	22.1.	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Ralf Steinmetz, Klara Nahrstedt	Multimedia Fundamentals: Media Coding and Content Processing	Prentice Hall	2002
		2.	Ralf Steinmetz, Klara Nahrstedt	Multimedia Systems	Springer	2004
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	D. Davcev	Multimedia Systems	Medis Informatics, Skopje	1995
		2.				
		3.				

Election No. 28	**Subject program from the first , second and third cycle of studies**				
1.	Title of the course	Operating systems			
2.	Code	ICS16E01			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	third year/ sixth semester	7.	Number of ECTS credits	6

8.	Teacher		Assoc. Prof. Dr. Daniela Mechkaroska		
9.	Prerequisites for enrolling in the course		Programming I		
10.	Objectives of the subject program (competencies): After completing this course, students should be able to: understand the functions and organization of operating systems, define processes and threads, gain experience with the allocation of processes and threads, understand and experiment with synchronization and communication processes, understand computer memory management and virtual memory techniques, understand the main concepts of input/output subsystems and system file manipulation, use and experiment with specific operating systems.				
11.	Course content: Weeks Issues and Chapters: 1. OS history and legitimacy; 2, 3 Processes and threads; 4, 5 Scheduling ; 6, 7 Memory management; 8, 9 Interprocess communication; 10 Input/output subsystems; 11, 12 Unix / Linux Operating System; 13 Windows Operating System; 14, 15 Android Operating System.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		

Literature

Required literature

	Serial number	A second	Title	Publisher	Year
22.1	1.	Andrew Tanenbaum	Modern Operating Systems	Pearson	2015
	2.				
	3.				

22.2 Additional literature

		Serial number	A second	Title	Publisher	Year
		1.	Silberschatz, Galvin, Gagne	Operating System Concepts	Wiley	2013
		2.	Stallings	Operating Systems: Internals and Design Principles	Prentice Hall	2008
		3.				

Election No. 29		**First cycle study program**			
1.	Title of the course	Information theory			
2.	Code	ICS16E02			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	Third year/sixth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Daniela Mechkaroska			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): Upon completion of the course, the student should be able to: 1. Demonstrates knowledge and understanding of the basics of information theory 2. Appreciate the notion of fundamental limitations in communication systems and all systems more generally 3. Develop a deeper understanding of communication systems 4. Apply the concept of information theory in various disciplines and information sciences				
11.	Course content: 1. Information Theory – Introduction, Information Measure, Average Information Content of Symbols in a Long Independent Sequence, Average Information Content of Symbols in a Long Dependent Sequence, Statistical Model for Information Source, Entropy and Information Rate of a Labeled Source 2. Source coding – Source output coding, Shannon coding algorithm, Communication channel, discrete communication channel, continuous channel 3. Basic performance constraints – Source coding theorem, Huffman code, discrete memoryless channel, Mutual information, channel capacity 4. Channel Coding Theorem – Channel Coding Theorem, Differential Entropy and Mutual Information for a Continuous Ensemble, Channel Capacity Theorem 5. Introduction to Error Control Coding – Error Types, Examples, Code Types, Linear Block Codes, Matrix Description, Error Detection and Correction, Standard Sequence and Lookup Table for Decoding, Binary Cyclic Codes, RS Codes, Golay Codes, Shortened Cyclic Codes, Burst Error Correction Codes, Burst and Random Error Correction Codes, Convolutional Codes.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars,	30 hours	

			teamwork	
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17.	Grading method 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Seminar paper/project (presentation: written and oral)	15 points
	17.3.	Activity and participation	5 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

Literature

Required literature

Serial number	A second	Title	Publisher	Year
1.	Todd.K.Moon,	Error Correction Coding: Mathematical Methods and Algorithms	Wiley-Interscience	2005
2.	Lin Shu, Costello Daniel J.	Error control coding fundamentals and applications	Pearson	2004
3.				

Additional literature

Serial number	A second	Title	Publisher	Year
1.	Yuan Jiang,	A Practical Guide to Error-Control Coding Using MATLAB	Artech House; Har/Cdr edition	2010
2.	TM Cover and JA Thomas	Elements of Information Theory	Wiley	2006
3.	R Bose,	Information Theory, Coding and Cryptography	TMH	2007

Election No. 30	**First cycle study program**	
1.	Title of the course	User interface design
2.	Code	ICS16E03
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study program (unit,	University of Information Sciences and Technologies "St.

	i.e. institute, department, division)	Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle – elective course from the study program				
6.	Academic year / semester	3rd year/6th semester	7.	Number of ECTS credits	6	
8.	Teacher	Assoc. Dr. Rasim Salkoski				
9.	Prerequisites for enrolling in the course					
10.	Objectives of the subject program (competencies): The goal of the program is for students to gain theoretical knowledge of the basic aspects of human perception, cognition and learning of the user interface, as well as practical application of these concepts, i.e. designing a user interface in a systematized manner, easy to understand and which will support user efficiency.					
11.	Course content: 1. What is a user interface? 2. Functionality and layout control 3. User-centered interface design 4. Emotional interaction and design 5. Basic principles of user interface organization 6. Usability concepts when interacting with a user interface 7. User analysis 8. Prototype creation 9. User interface evaluation - data analysis, interpretation, representation and interpretation.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours				
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours		
16.	Other forms of activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		
		16.3.	Home learning	35 hours		
17.	Grading method 80 + 10 +105					
	17.1.	Tests	80 points			
	17.2.	Homework	10 points			
	17.3.	Activity and participation	10 points			
18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)			
		from 51 to 60 points	6 (six) (E)			
		from 61 to 70 points	7 (seven) (D)			
		from 71 to 80 points	8 (eight) (C)			
		from 81 to 90 points	9 (nine) (B)			
		from 91 to 100 points	10 (ten) (A)			
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.				
20.	Language of instruction	English, Macedonian				
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures				
	Literature					
	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year

		1.	Shneiderman, B. and Plaisant, C.	Designing the User Interface: Strategies for Effective Human Computer Interaction (5th ed.)	AddisonWesley	2009
		2.	Soren Lauesen	User Interface Design	Pearson	2004
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Bill Scott and Theresa Neil	Web Design Interfaces	O'Reilly Media	2009
		2.				
		3.				

Election No. 31	**First cycle study program**				
1.	Title of the course	Programmable logic controllers			
2.	Code	ICS16E04			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective course from the study program			
6.	Academic year / semester	3rd year/6th semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Dr. Rasim Salkoski			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): The aim of this discipline is to introduce students to the different types of programmable controllers that exist on the market today, their operating principle and method of use. Upon successful completion of the course, students will be able to work with ladder diagrams and logic programming of PLCs. They will also be able to design PLC control systems, calculate the necessary hardware and software capacities of the control devices, etc.				
11.	Course content: Programmable logic controllers as part of control systems. Hardware aspects of PLCs. Construction, structure and operation of PLCs. Digital input modules. Digital output modules. Analog modules. Special and communication modules. Software aspects of PLCs. Ladder programming. Graphical programming. Practical application of PLCs. Control of a production process using PLCs. Control of an industrial elevator with PLCs. Control of a production line with PLCs.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	

		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17.	Grading method 80 + 10 +105		
	17.1.	Tests	80 points
	17.2.	Homework	10 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

Literature

Required literature

Serial number	A second	Title	Publisher	Year
1.	Petruzella, Frank D.	Programmable logic controllers	McGraw-Hill Education	2017
2.	L.A. Bryan, EA Bryan	Programmable Controllers: Theory and Implementation	Industrial Text Company	1997
3.				

Additional literature

Serial number	A second	Title	Publisher	Year
1.	EA Parr	Programmable Controllers An engineer's guide	Newnes	2003
2.	W. Bolton	Programmable Logic Controllers	Elsevier	2009
3.				

Election No. 32	**Subject program from the first , second and third cycle of studies**

1.	Title of the course	Numerical methods			
2.	Code	ICS16E05			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	III year/ 6th semester	7.	Number of ECTS credits	6

8.	Teacher		Prof. Dr. Elena Hadzieva		
9.	Prerequisites for enrolling in the course		Math 1, Linear Algebra		
10.	Objectives of the course program (competences): Students will first be able to distinguish between exact and approximate values, and then they will be able to apply numerical methods in solving systems of linear equations, nonlinear equations and nonlinear systems of equations, function interpolation and function approximation (fitting), numerical differentiation and integration, numerical solution of first-order differential equations.				
11.	Course content: Introduction to Python for numerical methods. Numerical methods for solving systems of linear algebraic equations. Interpolation. Approximation (fitting). Numerical methods for solving nonlinear equations. Numerical methods for solving systems of nonlinear equations. Numerical differentiation. Numerical integration. The concept of a differential equation. First- order differential equation. System of first- order linear differential equations . Numerical solution of a first- order differential equation with initial conditions (initial condition problems). Numerical solution of a system of first- order differential equations with initial conditions.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time		Lectures: 45 hours; classroom exercises: 15 hours; laboratory exercises: 15 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching, seminars, teamwork	45 hours	
		15.2.	Audition exercises	15 hours	
		15.2.	Laboratory exercises	15 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 10 + 10				
	17.1.	Tests		80 points	
	17.2.	Homework		10 points	
	17.3.	Activity and participation		10 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should attend classes regularly, according to the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				

		Required literature				
		Serial number	A second	Title	Publisher	Year
	22.1	1.	Kiusaalaas Jaan	Numerical Methods in Engineering with Python 3	Cambridge University Press	2013
		2.				

		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Steven C. Chapra, Raymond P. Canale	Numerical Methods for Engineers, 6 th edition	McGraw Hill, New York	2009
		2.				
		3.				

Election No. 33	**Subject program from the first , second and third cycle of studies**				
1.	Title of the course	Economics of electronic banking			
2.	Code	ICS16E06			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list			
6.	Academic year / semester	Second year/forth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Jovanka Damoska Sekuloska			
9.	Prerequisites for enrolling in the course	There is none.			
10.	Objectives of the course program (competences) : To gain a complete understanding both theoretically and practically of modern banking, of contemporary developments and trends in electronic banking. Students would learn the economic aspects, the organization and infrastructure of electronic banking and the creation of banking products and services in digital banking.				
11.	Course content: Introduction to electronic banking, Evolution of electronic banking, Products and services in electronic banking, Infrastructure in electronic banking, Economic aspects of electronic banking, Risks in electronic banking, Mechanisms and tools for protection in electronic banking, Mobile banking, Electronic payment system, FinTech and technological trends in banking				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	

	17.2.	Seminar paper/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction	English, Macedonian		
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures		

Literature

Required literature

	Serial number	A second	Title	Publisher	Year
22.1	1.	Tim Walker and Lucian Morris	The Handbook of Banking Technology	Wiley	2021
	2.	Mahmood Shah, Steve Clarke	E-Banking Management: Issues, Solutions and Strategies	IGI Global	2009
	3.	Allen N. Berger, Philip Moyneaux and John OS Wilson	The Oxford Handbook of Banking	Oxford University Press	2010

Additional literature

	Serial number	A second	Title	Publisher	Year
22.2	1.	M. Nakajima	Payment System Technologies and Functions: Innovations and Developments	IGI Global	2011
	2.				
	3.				

Election No. 34	**Subject program from the first , second and third cycle of studies**

1.	Title of the course	Internet Programming			
2.	Code	ICS16E07			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	3rd year / 6th semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Ustiana Rechkoska Shikoska			
9.	Prerequisites for enrolling in the course	Introduction to Programming, Object-Oriented Programming, Web Design			
10.	Objectives of the subject program (competencies):				

	Students will become more familiar with the concepts of object-oriented programming. The multiple use of objects, the use of protected elements from the inherited object will be analyzed. Introduction and use of interfaces. Use of static variables, functions and classes. Defining and using abstract classes. Handling run - time errors, introducing the concept of "exception", try , catch , finally . Casting objects. Detailed processing of the " string " object. Introduction to ArrayList . Defining and using " thread ", as well as Java applets. Html , CSS , JavaScript coding.				
11.	Course content: 1. Polymorphism. 2. Interfaces. 3. Object storage. 4. Error handling with exceptions. 5. Strings in Java. 6. I / O methods. 7. Threads . 8. Applets. 9. Html , CSS , JavaScript coding 10. Creating complete Web applications				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				
	22.1	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	Robert W. Sebesta	Programming the World Wide Web 8th edition	Pearson	2014
		2.	Eric T. Freeman, Elisabeth Robson	Head First JavaScript Programming	O'Reilly Media	2014
		3.	Marijn Haverbeke	Eloquent JavaScript, 3rd Edition: A Modern Introduction to Programming	No Starch Press	2018

	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Herbert Schildt	Java: A Beginner's Guide, Ninth Edition	McGraw-Hill	2022
		2.				
		3.				

Election No. 35		**First cycle study program**			
1.	Title of the course	Microprocessors			
2.	Code	ICS16E08			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	third year / sixth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Ile Dimitrievski			
9.	Prerequisites for enrolling in the course	Digital logic circuits			
10.	Objectives of the subject program (competencies): Upon completion of the course, the student will be able to: • know, understand, and apply professional terminology and concepts for digital circuits and microprocessors; • know, understand, and apply terminology and concepts from programming processors in assembler and connecting various hardware components; • identify different generations of microprocessors.				
11.	Course content: • Microprocessor architecture, data types • Global microprocessor architecture, registers, arithmetic logic unit, control unit • Pin diagram of a microprocessor • Use of stack memory • Basic concepts when connecting a microprocessor • Connecting to RAM and ROM memories • Virtual memory • Cache memory organization • Connecting to input-output ports • Interrupt systems • DMA transfer • Address coding • Microprocessor programming • Division of programming languages • Components of an assembly instruction • Addressing methods • Instruction set of a general microprocessor • Writing programs				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13	Total available fund	6 ECTS credits x 30 hours/credit = 180 hours			

.	on time				
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homework - assignments	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction	English, Macedonian			
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures			
22.	Literature				
	22.1.	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	K. Udaya Kumar	The 8085 Microprocessor: Architecture,	Pearson	2008

				Programming and Interfacing		
		2.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Barry B. Brey	Digital Design: Principles and Practices	Pearson	2013

Election No. 36		**First cycle study program**			
1.	Title of the course	Wireless networks			
2.	Code	ICS16E09			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	Third year/sixth semester	7.	Number of ECTS credits	6
8.	Teacher	According to the decision of a competent authority at UINT			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): This course covers the principles underlying the analysis and design of wireless communication networks. ● Understand the functions and operating principles of various components of wireless networks, and how connections are established and maintained ● Understand the complicated nature of wireless propagation and apply simple models for calculating link budget ● To become familiar with existing and future wireless communications technologies				
11.	Course content: ● Wireless Media – Air Interface Design, Radio Propagation Mechanism, Path Loss and Signal Coverage Models, Multipath and Doppler Effect, Channel Measurements and Modeling, Radio Channel Simulation ● Wireless Media Access – Fixed access assignment for voice networks, random access for data networks, integration of voice and data traffic, media access types (TDMA , FDMA , CDMA) ● Wireless Network Operation – Wireless Network Topology, Point-to-Point Wireless Links. Cellular Topology, Cell Basics, Signal- to-Interference Ratio, Capacity Expansion, Mobility Management, Resource and Power Management, Security in Wireless Networks ● Wireless LAN and HIPERLAN – introduction to wireless LAN , IEEE 802.11, WPAN IEEE 802.15, mobile ad-hoc networks (MANET), principles and operation, wireless home				

	networking, Bluetooth technology concept, wireless geolocation ● Wireless WAN – GSM and TDMA technology, mobile environment, communication in infrastructure, CDMA technology, IS 95, IMT 2000, Mobile data networks, CDPD networks, GPRS , mobile application protocol				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	40 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homework - assignments	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction	English, Macedonian			
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures			
22.	Literature				
	22.1.	Required literature			
		Serial number	A second	Title	Publisher	Year
		1.	William Stallings,	Wireless Communications and	Prentice Hall	2007

				Networks		
		2.	Leon Garcia, Widjaja	Communication Networks	TMH	2000
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Jon W Mark, Weihua Zhuang	Wireless communication and Networking	Prentice Hall	2003
		2.				
		3.				

Election No. 37	**First cycle study program**				
1.	Title of the course	Stochastic processes			
2.	Code	ICS16E10			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	3rd year/6th semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Aneta Velkoska			
9.	Prerequisites for enrolling in the course	/			
10.	Objectives of the subject program (competencies): The aim of the course is to introduce the student to the theoretical foundations of random processes that lie in martingales and martingale convergence theorems, then to become familiar with the basic processes, Markov, Poisson processes that find a wide application in various fields.				
11.	Course content: • Defining a stochastic process • Examples of stochastic processes • Martingales and stop times • Mark chains/chains • Chapman-Kolmogorov equations • Time-homogeneous Markov chains • Long-term distribution of the Markov chain • Modeling using Markov chains • Markov jump processes • Poisson process, Birth-and-death processes • Time-homogeneous Markov jump processes • Structure of Markov jump processes • Simulation of stochastic processes				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			

14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours
17.	Grading method 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Seminar paper/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction	English, Macedonian		
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures		

Literature

Required literature

Serial number	A second	Title	Publisher	Year
1.	A. Papoulis and SUPillai	Probability, Random Variables and Stochastics Processes	McGraw Hill	2002
2.				

Additional literature

Serial number	A second	Title	Publisher	Year
1.	JL Doob	Stochastic Process	Wiley	1953
2.				
3.				

Election No. 38		**First cycle study program**
1.	Title of the course	Databases 2
2.	Code	ICS16E11
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences

4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	Third year / sixth semester	7.	Number of ECTS credits	6
8.	Teacher	prof. Dr. Diana Capeska Bogatinoska			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): The widespread phenomenon of storing big data leads to the need for a new class of non-relational databases, commonly referred to as NoSQL databases. This course will explore the origins of NoSQL databases and their characteristics that distinguish them from traditional relational database systems. NoSQL databases will be presented , followed by an exploration of how different database technologies implement these basic concepts. The characteristics of each of the four main NoSQL database models (key - value , column - oriented , document) will be explained. databases , and graphs databases), highlighting the business needs that drive the development and use of each database. Finally, the criteria that decision makers should consider when choosing the appropriate database between relational and non-relational databases will be presented, as well as techniques for selecting the NoSQL database that best suits the specific use case. case . Students will be introduced in detail to MongoDB , a document - oriented non-relational database. Competencies: - competence in designing NoSQL databases. - competence in describing the differences between NoSQL databases and relational databases from a theoretical perspective. - competence in choosing a specific NoSQL database for specific use cases (use case).				
11.	Course content: Introduction; Comparative analysis between relational and non-relational databases; CAP theorem, Map-Reduce, Distributed Computing; Key-Value Databases; Document oriented databases; Column oriented databases; Graph Databases; Criteria for selecting an appropriate non-relational database in real cases. Introduction to MongoDB; MongoDB Syntax; Indexing; Replication; Sharding.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homework - assignments	35 hours	
17.	Method of assessment				
	17.1.	Tests		90 points	
	17.2.	Individual work/project (presentation: written and oral)		5 points	
	17.3.	Activity and participation		5 points	

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		51 x to 60 points	6 (six) (E)
		61 x to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	The student must ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

22.

Literature

Required literature

Serial number	A second	Title	Publisher	Year
1.	Eric Redmond; Jim R. Wilson.	Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement.	Pragmatic Bookshelf.	2012
2.	Shannon Bradshaw, Eoin Brazil, Kristina Chodorow	MongoDB: The Definitive Guide: Powerful and Scalable Data Storage	O'Reilly Media; 3rd edition	2019
3.				

22.1.

Additional literature

Serial number	A second	Title	Publisher	Year
1.	Guy Harrison	Next Generation Databases: NoSQLand Big Data	Apress; 1st ed. edition	2015
2.				
3.				

22.2.

Election No. 39	**First cycle study program**			
1.	Title of the course	Digital music		
2.	Code	ICS17E01		
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences		
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences		
5.	Degree (first, second, third cycle)	First cycle		
6.	Academic year / semester	4th year/ 7th semester	7.	Number of ECTS credits: 6
8.	Teacher	Dr. Atanas Hristov		
9.	Prerequisites for enrolling in the course			

10.	Objectives of the subject program (competencies): The aim of this course is to introduce you to all the properties of sound and everything we can do with it. During its implementation, various sounds from our environment will be recorded, these samples will be processed and new electronic (both analog and digital) sounds will be generated. The tasks include composing with these sounds, feedback, noise, etc., using DSP , convolution, algorithms, simple mixing, etc. The emphasis of the class is not on technology, mathematics or acoustics, although these are examined in varying depth. Instead, the focus is on the sonic and compositional aspects.					
11.	Course content: Concrete music, form and content. Studio basics, recording, music concrete, representation, Pro software basics Tools , detailed structure. Feedback and continuity. Studio feedback, Pro Tools bussing , hardware and software delays, hardware filtering, software reverb, continuous/improvised structure. Noise and layers. Convolution , Peak software, noise making, layering, software filters, noise reduction, other Pro plugins Tools , sculptural sound, beautiful sounds. Synthesis, algorithm, interaction (Max / MSP). Introduction to Max / MSP software - graphical programming environment - algorithmic composition, sound synthesis, interfaces for (performance) interaction. Sampling, remixing, polishing. Borrowing sounds from other sources (either a single source, a number of sources or your own compositions), using single sounds to make new music or polish a previous composition. Serato and applications.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.					
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours		
16.	Other forms of activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		
		16.3.	Home learning	35 hours		
17.	Grading method 80 + 15 + 5					
	17.1.	Tests		80 points		
	17.2.	Seminar paper/project (presentation: written and oral)		15 points		
	17.3.	Activity and participation		5 points		
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)		
			from 51 to 60 points	6 (six) (E)		
			from 61 to 70 points	7 (seven) (D)		
			from 71 to 80 points	8 (eight) (C)		
			from 81 to 90 points	9 (nine) (B)		
			from 91 to 100 points	10 (ten) (A)		
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.			
20.	Language of instruction		English and Macedonian language			
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures			
	Literature					
	22.1	Required literature				
		Serial	A second	Title	Publisher	Year

		number				
		1.	Hendrik Storstein Spilker	Digital Music Distribution: The Sociology of Online Music Streams	Routledge	2018
		Additional literature				
	22.2	Serial number	A second	Title	Publisher	Year
			Alessandro Cipriani, Maurizio Giri	Electronic Music and Sound Design: Theory and Practice with Max/MSP - Vol. 1 2010	ConTempoNet	2010

Election No. 40	**First cycle study program**				
1.	Title of the course	Cryptography			
2.	Code	ICS17E02			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective course from the study program			
6.	Academic year / semester	Fourth year/ seventh semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Daniela Mechkaroska			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): 1. Introducing students to cryptography and its applications 2. Introduction to basic cryptographic designs 3. Practical use of the studied cryptographic algorithms 4. Introduction to basic authentication concepts				
11.	Course content: 1. Security: computer security, information security, network security; cryptography, cryptosystem, cryptanalysis, security threats and attacks, security services, security mechanisms; 2. Classical cryptosystems: substitution techniques: Caesar, monoalphabetic, Playfair , Hill , polyalphabetic ciphers; One - time pad ; transposition techniques: Rail Fence encoder; 3. Symmetric cryptography – basic concepts, stream and block ciphers; description of the DES and AES algorithms; 4. Public key cryptography – basic concepts; description of RSA and El Gamal algorithms; key management - key exchange Diffie-Hellman scheme, elliptic curve cryptography; 5. Authentication requirements - authentication functions - message authentication codes (MAC) - hash functions - SHA -1, MD 5, security of hash functions and MAC - authentication protocols - digital signatures - digital signature standards, digital certificate, PGP . 6. Quantum cryptography, QKD , Application of quantum computers in cryptanalysis				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			

14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				
	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Douglas R. Simson	Cryptography – Theory and practice	CRC press	1995
		2.	A. Menezes, P. Van Oorschot and S. Vanstone	Handbook of Applied Cryptography	CRC press	2001
		3.				
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Stallings	Cryptography & Network Security	Pearson Education	2006
		2.				
		3.				

Election No. 41		**First cycle study program**
1.	Title of the course	Internet of Things

2.	Code	ICS17E03			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	4th year/ 7th semester	7.	Number of ECTS credits	6
8.	Teacher	According to the decision of a competent authority at UINT			
9.	Prerequisites for enrolling in the course	Dr. Daniela Mechkaroska			
10.	Objectives of the subject program (competencies): 1. Students will gain knowledge about the concepts related to the Internet of Things, as well as the technologies that enable the Internet of Things. 2. Increasing the creative outlook on the Internet. 3. The main focus is placed on the opportunities offered by the technologies included in the Internet of Things, as well as the creative outlook for finding innovative applications that combine those technologies in everyday life scenarios. 4. Introduction and practical implementation of projects on existing Internet of Things platforms.				
11.	Course content: • What is the Internet of Things (IoT). Basic concepts and applications for IoT • IoT enabling technology; IoT architecture: oneM2M and IoTWF • Smart objects and user interfaces; • Networking basics; learning about LoRaWAN, Zigbee, BLE, and other wireless protocols that will connect things to the Internet. • IoT sensing and actuation ; • IoT platform design methodology • IoT physical devices and endpoints • IoT systems - logic design using Python • Preparation of IoT projects (for Raspberry Pi) • IoT physical servers & cloud offerings (cloud offerings)				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	40 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	

			16.3.	Homework - assignments	35 hours
17.	Grading method 80 + 15 + 5				
	17.1.	Tests			80 points
	17.2.	Individual work/project (presentation: written and oral)			15 points
	17.3.	Activity and participation			5 points
18.	Assessment criteria (points/grade)			up to 50 points	5 (five) (F)
				from 51 to 60 points	6 (six) (E)
				from 61 to 70 points	7 (seven) (D)
				from 71 to 80 points	8 (eight) (C)
				from 81 to 90 points	9 (nine) (B)
				from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam			Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction			English, Macedonian	
21.	Method of monitoring the quality of teaching			Monitoring UINT control procedures	

22. Literature

Required literature

Serial number	A second	Title	Publisher	Year
1.	R. Buyya, AV Dastjerdi	Internet of Things: Principles and Paradigms	Morgan Kaufmann	2016
2.	Arshdeep Bahga, Vijay Madisetti	Internet of Things_ A Hands-On Approach	Universities Press	2015

Additional literature

Serial number	A second	Title	Publisher	Year
1.	Peter Waher	Learning Internet of Things	Packt Publishing	2015

Election No. 42		**First cycle study program**
1.	Title of the course	Digital signal and image processing
2.	Code	ICS17E04
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences

5.	Degree (first, second, third cycle)		First cycle				
6.	Academic year / semester		fourth year/ seventh semester	7.	Number of ECTS credits	6	
8.	Teacher		Assoc. Dr. Rasim Salkoski				
9.	Prerequisites for enrolling in the course						
10.	Objectives of the subject program (competencies): Upon completion of the course, the student is expected to master and use the basic methods and tools for signal and image processing.						
11.	Course content: Signal presentation: overview of discrete time signals in time and frequency domain (Z-transform and Fourier representation, sampling and quantization, stochastic signals and noise processing). Image analysis: Introduction. Image processing. Image processing programs. Fundamentals of digital image processing. Image presentation. Image digitization. Programs for presenting digital images. Image processing programs. Basic Matlab commands, elementary functions, variables, vectors, matrices. Image operations in Matlab. Supported image formats and their conversions. Image processing, analysis, transformation and visualization with Matlab. Statistical image processing. Basic image processing operations. Image enhancement with filtering and segmentation. Basic image processing with Photoshop, basic screen, basic tools, settings, resolutions, backgrounds and units. Working with files. Drawing, toning, focusing and marking tools. Transformations, effects, filters and deformations. Color theory. Color models. Basic color correction. Creating special effects.						
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.						
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours				
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours				
15.	Forms of teaching activities		15.1.	Lectures - theoretical teaching.		45 hours	
			15.2.	Exercises (laboratory, classroom), seminars, teamwork.		40 hours	
16.	Other forms of activities		16.1.	Project tasks		35 hours	
			16.2.	Independent tasks		35 hours	
			16.3.	Homework - assignments		35 hours	
17.	Grading method 80 + 15 + 5						
	17.1.	Tests			80 points		
	17.2.	Individual work/project (presentation: written and oral)			15 points		
	17.3.	Activity and participation			5 points		
18.	Assessment criteria (points/grade)			up to 50 points	5 (five) (F)		
				from 51 to 60 points	6 (six) (E)		
				from 61 to 70 points	7 (seven) (D)		
				from 71 to 80 points	8 (eight) (C)		
				from 81 to 90 points	9 (nine) (B)		
				from 91 to 100 points	10 (ten) (A)		
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.				
20.	Language of instruction		English and Macedonian				
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures				
22.	Literature						
	22.1.	Required literature					
		Serial number	A second	Title	Publisher	Year	

		1.	Rafael Gonzalez and Richard Woods	Digital Image processing, 3rd edition	Prentice Hall	2008
		2.				
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Chris Solomon, Toby Breckon	Fundamentals of Digital Image Processing:	A Practical Approach with Examples in Matlab Wiley	2011
		2.				
		3.				

Election No. 43	**Subject program from the first , second and third cycle of studies**

1.	Title of the course	Optimization methods			
2.	Code	ICS17E05			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	IV year/ VII semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Elena Hadzieva			
9.	Prerequisites for enrolling in the course	Discrete Mathematics, Mathematics 1, Mathematics 2, Linear Algebra, Numerical Methods			
10.	Course objectives (competencies): Students will learn about the importance of optimization in decision-making in engineering. The optimal solution is actually the best decision. In this course, students will see the application of all previous mathematics courses from previous semesters. They will learn about unconditional optimization - a concept, one-dimensional search methods (golden section method, Fibonacci method, Newton's method, secant method), gradient methods (streamline descent method), analysis and comparison between methods. They will also learn about multidimensional methods: the geometric and simplex method for solving linear programming problems, as well as the two-phase simplex method. They will practice exercises in Python for what they have learned.				
11.	Course content: Required terms and concepts from discrete mathematics, mathematics 1, mathematics 2, linear algebra. Terms and concepts from geometry: line and plane, hyperplane, convex set, neighborhood, polytope and polyhedron. Unconditional optimization. Golden section method. Fibonacci method. Newton's method. Secant method. Gradient methods. Steepest descent method. Analysis of methods. Convergence, Degree of convergence. Introduction to linear programming. Real problems that reduce to a linear model. Basic solutions. Feasible solutions (feasible solutions). Expanded matrix. Simplex method. Simplex method in matrix form. Simplex method in two stages. Exercises in Python.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory,	30 hours	

			classroom), seminars, teamwork	
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17.	Grading method 80 + 10 +10		
	17.1.	Tests	80 points
	17.2.	Homework/ project	10 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should attend classes regularly, according to the UINT regulations.	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

Literature

Required literature

Serial number	A second	Title	Publisher	Year
1.	Edwin KP Chong, Stanislaw H. Zak	An Introduction to Optimization, 2nd edition	Wiley Interscience Series, John Wiley and Sons, inc	2001
2.				
3.				

Additional literature

Serial number	A second	Title	Publisher	Year
1.	Mark French	Fundamentals of Optimization. Methods, Minimum Principles and Applications for Making Things Better	Springer	2018
2.				
3.				

Election No. 44	**Subject program from the first , second and third cycle of studies**	
1.	Title of the course	Data Engineering
2.	Code	ICS17E06
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences

<table>
<tr><td>4.</td><td>Organizer of the study program (unit, i.e. institute, department, division)</td><td colspan="4">University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences</td></tr>
<tr><td>5.</td><td>Degree (first, second, third cycle)</td><td colspan="4">First cycle – mandatory subject</td></tr>
<tr><td>6.</td><td>Academic year / semester</td><td>2nd year/ 3rd semester</td><td>7.</td><td>Number of ECTS credits</td><td>6</td></tr>
<tr><td>8.</td><td>Teacher</td><td colspan="4">Assoc. Dr. Ljubinka Sandžakoska</td></tr>
<tr><td>9.</td><td>Prerequisites for enrolling in the course</td><td colspan="4">there is no</td></tr>
<tr><td>10.</td><td colspan="5">Objectives of the subject program (competencies):
● Students will be introduced to the basic concepts, processes, and tools of data engineering.
● To be trained in data collection and integration, modeling, preliminary data analysis, as well as effective communication within the company with data teams
● Students gain an understanding of the modern data ecosystem and the role that data engineers, data scientists, and data analysts play in this ecosystem (difference in roles and tasks of different data processing teams)</td></tr>
<tr><td>11.</td><td colspan="5">Course content:
1. Data Engineering ?
- Definition and evolution of data engineering
- Key players in data engineering
- Responsibilities and skills of a data engineer
2. The Data Engineering Ecosystem .
- Overview of the data engineering ecosystem
- Data types
- Understanding different types of file formats
- Data sources
- Data processing languages
- Working with different data sources and types
- Overview of Data Repositories
- Data Warehouses, Data Marts and Data Lakes
- ETL, ELT and Data Pipelines
- Data Integration Platforms
- Foundations of the concept of "Big Data" of Big Data) and its impact on data engineering (Eng. Impact of Big Data on Data Engineering)
- Basic tools for processing big data: Hadoop , HDFS , Hive , and Spark .
3. Data Engineering Lifecycle
- Data platform architecture
- Factors for selecting and designing data warehouses
- Security and importance of data security
- How to collect and import data
- Data Wrangling and Data Wrangling Tools
- Data search and analysis
- Performance tuning and troubleshooting
- Governance and compliance</td></tr>
<tr><td>12.</td><td colspan="5">Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.</td></tr>
<tr><td>13.</td><td colspan="3">Total available fund on time</td><td colspan="2">6 ECTS credits x 30 hours/credit = 180 hours</td></tr>
<tr><td>14.</td><td colspan="3">Allocation of available time</td><td colspan="2">Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours</td></tr>
<tr><td rowspan="2">15.</td><td rowspan="2">Forms of teaching activities</td><td>15.1.</td><td>Lectures - theoretical teaching</td><td colspan="2">45 hours</td></tr>
<tr><td>15.2.</td><td>Exercises (laboratory, classroom), seminars, teamwork</td><td colspan="2">30 hours</td></tr>
</table>

16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17.	Grading method 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Seminar paper/project (presentation: written and oral)	10 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should attend classes regularly in accordance with the UINT regulations.	
20.	Language of instruction	English and Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

	Literature					
	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Joe Reis, Matt Housley	Fundamentals of Data Engineering: Plan and Build Robust Data Systems, 1st Edition	O'Reilly Media	2022
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Vijay Kotu Bala Deshpande	Data Science Concepts and Practice, 2nd edition	Morgan Kaufmann is an imprint of Elsevier	2019

Election No. 45	**Subject program from the first , second and third cycle of studies**

1.	Title of the course	Multiplatform programming			
2.	Code	ICS17E07			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	4th year/ 7th semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Dr. Ustiana Rechkoska Shikoska			
9.	Prerequisites for enrolling in the course	Object-oriented programming, Internet programming			
10.	Objectives of the subject program (competencies): In this course, students will learn how to build a mobile application that can be used on more than one				

	platform (Android + iOS). The concept of building a mobile application, the differences, as well as the errors that can occur between different platforms, will be elaborated.				
11.	Course content: 1. Preparing the environment (operating system) for development. 2. Downloading and installing the dependencies required for building and debugging the application. 3. Introduction to the concept of a mobile application. 4. Introduction to the visual components used in the graphical interface. 5. Introduction to the programming language used to build the logic and functionality of the mobile application itself. 6. Using the hardware components of the phone. 7. Communication with an external API , and asynchronous calls to the server. 8. Using the internal memory of the phone. 9. Uploading the application to the PlayStore / AppStore .				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home learning	35 hours	
17.	Grading method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper/project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures		
	Literature				

	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Bonnie Eisenman	Learning React Native Building Mobile Applications with JavaScript	O'Reilly Printed in the United States of America	2016

		2.	Jonathan Peppers	Xamarin Cross-platform Application Development	Packt Publishing	2014
		3.	Chris Griffith	Mobile app development with Ionic 2	O'Reilly Media	2017
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Scott Olson, John HUNTer, Ben Horgen, Kenny Goers	Professional Cross-Platform Mobile Development in C#	Wiley	2012

Election No. 46		**First cycle study program**			
1.	Title of the course	Music and Mathematics			
2.	Code	ICS17E08			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	3rd year / 6th semester	7.	Number of ECTS credits	6
8.	Teacher	Dr. Aneta Velkoska			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): The goal of this course program is to awaken students' interest in the general science of harmony, whose task is to explore new connections between certain sciences and arts, especially mathematics and music.				
11.	Course content: • Mathematics and music together throughout history. • Number and tone. • Math, music and spirals, logarithmic spiral. • Rhythm theory. • Using logarithms in music. • History of tonal scales. • Fourier analysis and partial tones. • Universal law of the octave. • The Fibonacci sequence in music. • Plato's Bodies and Music.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	

			16.3.	Home learning	35 hours
17.	Grading method 80 + 15 + 5				
	17.1.	Tests			80 points
	17.2.	Seminar paper/project (presentation: written and oral)			15 points
	17.3.	Activity and participation			5 points
18.	Assessment criteria (points/grade)			up to 50 points	5 (five) (F)
				from 51 to 60 points	6 (six) (E)
				from 61 to 70 points	7 (seven) (D)
				from 71 to 80 points	8 (eight) (C)
				from 81 to 90 points	9 (nine) (B)
				from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam			Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction			English, Macedonian	
21.	Method of monitoring the quality of teaching			Monitoring UINT control procedures	
	Literature				

		Required literature				
		Serial number	A second	Title	Publisher	Year
	22.1	1.	J. Fauvel, R. Flood, R. Wilson	Music and Mathematics: From Pythagoras to Fractals	Oxford University Press	2006
		2.				
		3.				
		Additional literature				
		Serial number	A second	Title	Publisher	Year
	22.2	1.	D. Wright	Mathematics and Music	American Mathematical Society	2009
		2.				
		3.				

Elective No. 50		**Course program of the first cycle of studies**			
1.	Title of the course	Wireless Mobile Systems			
2.	Code	ICS17E12			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology “St. Paul the Apostle” - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	IV year / VII semester	7.	Number of ECTS credits	6
8.	Teacher	Asst. Prof. Jovan Karamachoski, PhD			

<table>
<tr><td>9.</td><td>Prerequisites for enrolling in the course</td><td colspan="3"></td></tr>
<tr><td>10.</td><td colspan="4">Objectives of the course (competencies):
To learn about wireless networks, protocol stack and standards
To learn about the basics of 3G services, their protocols and applications
To learn about the evolution of 4G networks, their architecture and applications
To gain competence in the latest 3G/4G/5G/6G and WiMAX networks and their architecture
Design and implementation of wireless networks for their applications using the latest wireless protocols and standards
To implement various types of applications for smartphones and mobile devices with the latest network strategies</td></tr>
<tr><td>11.</td><td colspan="4">Course content:
Introduction: Types of wireless technologies, WLAN technologies, infrared, UHF narrowband, spread spectrum. IEEE 802.11: system architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a, HiperLAN, WATM, BRAN, HiperLAN2. Bluetooth: architecture, radio layer, baseband layer, link management protocol, security. IEEE 802.16 WiMAX: physical layer, MAC, spectrum allocation for WiMAX. Mobile cellular systems. Characteristics of cellular systems.
Network layer in mobile networks: Introduction, mobile IP, IP packet delivery, agent discovery, tunneling and encapsulation, IPv6 internet network layer, mobile IP session initialization protocol, mobile ad-hoc networks: routing, destination sequence, distance vector, dynamic source routing
Transport layer in mobile networks: TCP improvements for wireless protocols, traditional TCP, congestion control, fast retransmission/fast recovery, mobility implications, improvement of classic TCP, indirect TCP, snooping TCP, mobile TCP, counter freezing, selective retransmission, transaction-oriented TCP, TCP over 3G wireless networks
Wireless WAN: overview of UMTS terrestrial radio access network, UMTS core architecture, 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP, HSDPA, LTE network architecture and protocols
4G networks: Introduction, 4G characteristics and challenges, 4G applications, 4G technologies, multi-carrier modulation, smart antenna techniques, OFDM-MIMO systems, adaptive modulation and coding with time slot scheduling, Cognitive radio
5G and 6G networks: Introduction, characteristics, challenges.</td></tr>
<tr><td>12.</td><td colspan="4">Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises</td></tr>
<tr><td>13.</td><td>Total available time fund</td><td colspan="3">6 ECTS credits x 30 hours/credit = 180 hours</td></tr>
<tr><td>14.</td><td>Distribution of the available time</td><td colspan="3">Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours</td></tr>
<tr><td rowspan="2">15.</td><td rowspan="2">Forms of teaching activities</td><td>15.1.</td><td>Lectures - theoretical teaching.</td><td>45 hours</td></tr>
<tr><td>15.2.</td><td>Exercises (laboratory, classroom), seminars, teamwork.</td><td>40 hours</td></tr>
<tr><td rowspan="3">16.</td><td rowspan="3">Other forms of activities</td><td>16.1.</td><td>Project tasks</td><td>35 hours</td></tr>
<tr><td>16.2.</td><td>Independent tasks</td><td>35 hours</td></tr>
<tr><td>16.3.</td><td>Home study - tasks</td><td>35 hours</td></tr>
<tr><td>17.</td><td colspan="4">Method of assessment 80 + 15 + 5</td></tr>
</table>

	17.1.	Tests		80 points
	17.2.	Individual work / project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points / grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and taking the final exam		Students must ensure regular attendance of classes in accordance with the UINT regulations	
20.	Language of instruction		English and Macedonian	
21.	Method of monitoring the quality of teaching		Following the control procedures of UINT	

22. Literature

22.1. Mandatory literature

Serial number	Author	Title	Publisher	Year
1.	Martin Sauter	From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband (4th Edition)	Wiley	2021
2.	Jochen Schiller	Mobile Communications	Second Edition, Pearson Education	2011
3.				

22.2. Additional literature

Serial number	Author	Title	Publisher	Year
1.	Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming	3G Evolution HSPA and LTE for Mobile Broadband	Second Edition, Academic Press	2008
2.				
3.				

Elective No. 48	**Course program of the first cycle of studies**	
1.	Title of the course	Platform Engineering

2.	Code	ICS17E10			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	4th year / 7th semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Jovan Karamachoski, PhD			
9.	Prerequisites for enrolling in the course	Passed state matura (secondary school diploma)			
10.	Objectives of the course (competencies): Knowledge of the concepts of virtualization and working with containers, DevOps practices and processes of continuous software development and integration. Ability to work with Docker, Kubernetes, Ansible, Terraform, KVM, HyperV. Ability to work with local and cloud-based infrastructure.				
11.	Course content: ● Basic Linux commands, Linux data structure and management of Linux-based operating systems (User management, data access management, service management, debugging and working with log files, firewall management). ● Virtualization. Basic concepts of virtualization, types of virtualization and virtualization of system components (storage, network resources, processing resources, etc.), working with Xen, KVM, HyperV and VMware hypervisor ● Container orchestration and application lifecycle management. Introduction to the DevOps methodology. CI/CD concept (continuous integration and continuous delivery). Principles of continuous software development and integration. Infrastructure development in OpenStack, local deployment and working with Kubernetes and Docker, container orchestration with Nomad. Cloud-based Container-as-a-service on AWS (Fargate) and Azure (Containers), Kubernetes-as-a-service on EKS (AWS), AKS (Azure), GKE (Google Cloud Services), Function-as-a-service on Lambda (AWS). ● Module configuration management. Ansible/Terraform/Pupper/Salt				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises				
13.	Total available time fund	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Distribution of the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home study	35 hours	
17.	Method of assessment 80 + 15 + 5				
	17.1.	Tests	80 points		
	17.2.	Seminar paper / project (presentation: written and oral)	15 points		
	17.3.	Activity and participation	5 points		
18.	Assessment criteria (points / grade)	up to 50 points	5 (five) (F)		
		from 51 to 60 points	6 (six) (E)		

		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and taking the final exam	Students must ensure regular attendance of classes in accordance with the UINT regulations	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Following the control procedures of UINT	

	Literature					
	22.1	Mandatory literature				
		Serial number	Author	Title	Publisher	Year
		1.	N. G. Nguyen, D.-N. Le, J. M. Chatterjee and R. Kumar	Cloud Computing and Virtualization	Wiley	2018
		2.	M. Portnoy	Virtualization Essentials 2nd Edition	Wiley	2016
		3.				
	22.2	Additional literature				
		Serial number	Author	Title	Publisher	Year
		1.	H. Saito, H.-C. C. Lee and K.-J. C. Hsu	Kubernetes Cookbook: Practical Solutions to Container Orchestration	Packt Publishing	2018
		2.				
		3.				

Elective No. 49	**Course program of the first cycle of studies**				
1.	Title of the course	Cloud Data Processing			
2.	Code	ICS17E11			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology “St. Paul the Apostle” - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	4th year / 7th semester	7.	Number of ECTS credits	6
8.	Teacher	Prof. Aneta Velkoska, PhD			
9.	Prerequisites for enrolling in the course	/			
10.	Objectives of the course (competencies): Cloud data processing has evolved as a very important computing model, which enables information, software and other shared computing-information resources to be provided over the Internet network on-demand. The goal of this course is for students to become familiar with the current practices in cloud data processing, and upon completing this course they will know about the principles and technologies of cloud data processing, the different architectures of those technologies and their implementation in the everyday use of these technologies and services. The course covers various information technologies such as networking, storage, computer applications, security, etc.				
11.	Course content: • Peer-to-peer systems • Infrastructure-as-a-service (IaaS),				

	• Platform-as-a-service (PaaS), • Software-as-a-service (SaaS), • Different cloud models, i.e. public cloud, private cloud, hybrid cloud • Application of several cloud data processing paradigms • Parallel programming and architecture • Map reduce programming • Distributed computing models and technologies • Global state of a group of cuts • Communication protocols, process coordination • Logical clocks • Runs and cuts; causal history • Concurrency • Consensus protocol • Virtualization • Cloud management • Various data storage systems • Fault detection and recovery of cloud system failures • Gossip algoritham • Security and privacy of cloud data from the real world.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises					
13.	Total available time fund			6 ECTS credits x 30 hours/credit = 180 hours		
14.	Distribution of the available time			Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours		
16.	Other forms of activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		
		16.3.	Home study	35 hours		
17.	Method of assessment 80 + 15 + 5					
	17.1.	Tests		80 points		
	17.2.	Seminar paper / project (presentation: written and oral)		15 points		
	17.3.	Activity and participation		5 points		
18.	Assessment criteria (points / grade)		up to 50 points	5 (five) (F)		
			from 51 to 60 points	6 (six) (E)		
			from 61 to 70 points	7 (seven) (D)		
			from 71 to 80 points	8 (eight) (C)		
			from 81 to 90 points	9 (nine) (B)		
			from 91 to 100 points	10 (ten) (A)		
19.	Requirement for signature and taking the final exam		Students must ensure regular attendance of classes in accordance with the UINT regulations			
20.	Language of instruction		English, Macedonian			
21.	Method of monitoring the quality of teaching		Following the control procedures of UINT			
	Literature					
	22.1	Mandatory literature				
		Serial	Author	Title	Publisher	Year

		number				
		1.	D. C. Marinescu	Cloud Computing, Theory and Practice	Elsevier Inc	2013
		2.				
	22.2	Additional literature				
		Serial number	Author	Title	Publisher	Year
		1.	M. Jelasity	Gossip-based Protocols for Large-scale Distributed Systems	PhD Dissertation	2013
		2.				
		3.				

Elective No. 51	**Course program of the first, second and third cycle of studies**				
1.	Title of the course	Machine Learning			
2.	Code	ICS17E13			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	4th year / 7th semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Anis Sefidanoski, PhD			
9.	Prerequisites for enrolling in the course	Linear algebra, Probability and statistics, Mathematics 3			
10.	Objectives of the course (competencies): The goal of the course is for students to become familiar with the decision-making methods for sample classification (Nearest neighbor algorithm and Bayesian decision theory), how classifiers are optimized, the way of analyzing samples by groups, the basic concepts of the K-means clustering algorithm, processing of structured and unstructured human speech, construction of neural networks and application of deep learning				
11.	Course content: Introduction to machine learning, Supervised learning and linear regression, Classification and logistic regression, Unsupervised learning, Natural language processing (NLP), Introduction to deep learning, Time series analysis				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises				
13.	Total available time fund	6 ECTS credits x 30 hours/credit = 180 hours			

14.	Distribution of the available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home study	35 hours

17.	Method of assessment 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Seminar paper / project (presentation: written and oral)	15 points
	17.3.	Activity and participation	5 points

18.	Assessment criteria (points / grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and taking the final exam	Students must ensure regular attendance of classes in accordance with the UINT regulations	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Following the control procedures of UINT	

	Literature					
	22.1	Mandatory literature				
		Serial number	Author	Title	Publisher	Year

		1.	Ian Goodfellow, Aaron Courville, Yoshua Bengio	Deep Learning	MIT Press	2015
		2.				
		3.				
	22.2	Additional literature				
		Serial number	Author	Title	Publisher	Year
		1.	Ian H. Witten, Eibe Frank, Mark A.	Data Mining: Practical Machine	Morgan Kaufmann	2011
		2.				
		3.				

Elective No. 52	**Course program of the first cycle of studies**				
1.	Title of the course	Legal Protection of Data			
2.	Code	ICS17E14			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	3rd year / 5th semester	7.	Number of ECTS credits	6
8.	Teacher	Ivan Bimbilovski, PhD			
9.	Prerequisites for enrolling in the course	Passed state matura (secondary school diploma)			
10.	Objectives of the course (competencies): At the end of the semester, students will be able to: • To understand how the European data protection regulation (GDPR) and the related legal regulations of the European Union function; • To understand how compliance with the European data protection regulation (GDPR) and the related legal regulations of the European Union is achieved; • To independently determine and fulfill the legal data protection obligations arising from the European data protection regulation (GDPR) and the related legal regulations of the European Union; • To introduce data control and protection in business processes; • To develop and implement data protection policies and procedures for data controllers and processors; • To detect gaps in existing data protection policies and procedures for data controllers and processors; • To carry out Data Protection Audits and Privacy Impact Assessments of data processing; • To launch initiatives for improving data security.				
11.	Course content: The course program is essentially a legal program adapted to the specifics of the Digital Business Informatics study program, i.e. the needs of the students in Digital Business Informatics, and covers topics and problems such as: key definitions (what constitutes personal data, who are data controllers and processors); data protection principles (lawfulness, fairness and transparency; limitation of the				

	purpose and intent of data processing; minimization in data collection and processing; accuracy and precision; limitation of data storage; integrity and confidentiality (security); accountability); legal basis for data processing (consent; contract; legal obligation; vital interest; public task; legitimate interests; special categories of data; data on convictions and serving of sentences); personal rights (right to be informed about data processing; right of access to data; right to rectification; right to be forgotten (right to request erasure of data); right to request restriction of data processing; right to data portability; right to object to data processing; rights related to automated decision-making and profiling); accountability and governance (contracts, documentation; data protection by design and by default; data protection impact assessment; data protection officers; codes of conduct; certification; fees for services related to data processing and access to processed data); security (encryption; ransomware; passwords in online services; system intrusions); international data transfers (agreements and guidelines for international data transfer; risk assessment in international data transfer); exemptions (immigration-based exemptions); national security and defense, etc.				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises				
13.	Total available time fund		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Distribution of the available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures – theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home study	35 hours	
17.	Method of assessment 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper / project (presentation: written and oral)		15 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points / grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and taking the final exam		Students must ensure regular attendance of classes in accordance with the UINT regulations		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Following the control procedures of UINT		

Literature

	22.1	Mandatory literature				
		Serial number	Author	Title	Publisher	Year
		1.	Eduardo Ustaran	European Data Protection: Law and Practice, 2nd Edition	International Association of Privacy Professionals (IAPP)	2019
	22.2	Additional literature				

		Serial number	Author	Title	Publisher	Year
		1.	Information Commissioners Office	Guide to the General Data Protection Regulation (GDPR)	Information Commissioners Office	2022

Elective No. 53		**Course program of the first cycle of studies**			
1.	Title of the course	Wireless Sensor Networks			
2.	Code	ICS17E15			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	4th year / 7th semester	7.	Number of ECTS credits	6
8.	Teacher	Asst. Prof. Ile Dimitrievski, PhD			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the course (competencies): To understand the concepts of sensor networks 1. To understand sensor networks 2. To learn sensor network architectures and the various protocols				
11.	Course content: 1. Overview of sensor networks – Introduction, applications, design problems, requirements, sensor node architecture 2. Network architecture – Optimization goals, evaluation metrics, principles of network design, operating system for sensor networks and a brief introduction to sensor network programming 3. Network protocols – MAC protocols and energy efficiency 4. Routing protocols – Data-centric, hierarchical, location-based, energy-efficient routing, etc., sensor deployment, problems with coverage and transmission scheduling, self-organization and topological control, requirements, data collection and processing, collaborative information processes and group connectivity, target tracking, localization and identity management, power management, security and privacy				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises				
13.	Total available time fund	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Distribution of the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, home work: 105 hours = Total time of 180 hours			

15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours
16.	Other forms of activities	16.1.	Project tasks	35
		16.2.	Independent tasks	35
		16.3.	Home study - tasks	35

17.	Method of assessment 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Individual work / project (presentation: written and oral)	15 points
	17.3.	Activity and participation	5 points

18.	Assessment criteria (points / grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)

19.	Requirement for signature and taking the final exam	Students must ensure regular attendance of classes in accordance with the UINT regulations
20.	Language of instruction	English and Macedonian
21.	Method of monitoring the quality of teaching	Following the control procedures of UINT

22.	Literature					
	22.1.	Mandatory literature				
		Serial number	Author	Title	Publisher	Year
		1.	Charles E.Perkins	Ad hoc Networking	Pearson education	2001
		2.				
		3.				
	22.2.	Additional literature				

		Serial number	Author	Title	Publisher	Year
		1.	Raheem Beyah	Security in Ad hoc and Sensor Networks	World Scientific Publications / Cambridge University Press	2010
		2.				
		3.				

Elective No. 54	**Course program of the first, second and third cycle of studies**

1.	Title of the course	Parallel Programming			
2.	Code	ICS18E01			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology “St. Paul the Apostle” - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	4th year / 8th semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Atanas Hristov, PhD			
9.	Prerequisites for enrolling in the course	Introduction to programming, algorithms and data structures			
10.	Objectives of the course (competencies): Upon completing this course, students will gain a clear understanding of modern multi-core and distributed architectures, will learn the basics of shared and distributed memory systems, will learn to write parallel programs using Pthread, will learn to perform parallelization at the level of physical and logical threads with Open MP and Intel TBB, as well as to use both methods in a single program. Most importantly, they will learn how to optimize programs and how to calculate the speedup when using parallel programs and algorithms.				

11.	Course content: 1. Introduction, motivations and history of parallel programming. 2. Parallel architectures - modifications of the Von Neumann architecture and the benefits thereof. 3. Parallel Hardware 4. Designing parallel algorithms. 5. Parallel software and performance measurement. 6. Programming for shared memory systems (Open MP and Intel TBB). 7. Basic structures in programming with Open MP 8. Implementations (Sieve of Eratosthenes, Monte Carlo methods, Matrix operations, linear problems, sorting, combinatorial search, etc.). 9. Analysis and evaluation of performance. 10. Implementation of parallel programming in bioinformatics, genetic algorithms.			
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises			
13.	Total available time fund		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Distribution of the available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home study	35 hours
17.	Method of assessment 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Seminar paper / project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points / grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and taking the final exam		Students must ensure regular attendance of classes in accordance with the UINT regulations	

20.	Language of instruction		English and Macedonian			
21.	Method of monitoring the quality of teaching		Following the control procedures of UINT			
	Literature					
	22.1	Mandatory literature				
		Serial number	Author	Title	Publisher	Year
		1.	Peter Pacheco, Matthew Malensek	An Introduction to Parallel Programming	Elsevier	2021
	22.2	Additional literature				
		Serial number	Author	Title	Publisher	Year
		1.	Michael Quinn	Parallel Programming in C with MPI and OpenMP	McGraw-Hill	2010

Elective No. 55		**Course program of the first cycle of studies**			
1.	Title of the course	Blockchain Development			
2.	Code	ICS18E02			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology “St. Paul the Apostle” - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	Fourth year / eighth semester		Number of ECTS credits	6
8.	Teacher	Daniela Meckaroska, PhD			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the course (competencies): This course aims to introduce students to the field of cryptographic primitives, to show how cryptographic primitives can be used to build secure electronic currencies such as Bitcoin, as well as to explore how the basic principles can be used in other fields. This course focuses on blockchain technology, the tool that will revolutionize all industries, not just the field of finance. Upon completing the course, students will have a broad understanding of blockchain technologies and will be able to make a project using this technology.				
11.	Course content: Introduction and a brief overview of the history of money and currencies. Basic concept of cryptocurrencies. Basic concepts of symmetric and asymmetric cryptography. Hash functions. Introduction to Blockchain technologies, characteristics, advantages and disadvantages. The Byzantine Generals problem. Consensus mechanisms. Bitcoin. Characteristics of Bitcoin. Bitcoin				

	transactions. Blockchain concepts. Blockchain technologies: Ethereum, Cosmos, Hyperledger. Scaling of Blockchain technologies. Smart contracts. Blockchain applications. Digital wallets. Cryptocurrency mining. Cryptocurrency privacy. Cryptocurrency security. Risks of using cryptocurrencies. Cybercrime with cryptocurrencies. Global trends in the legal framework and regulation of cryptocurrencies. Economic aspects of cryptocurrencies and their application. Business applications for cryptocurrencies. Blockchain, big data, Artificial Intelligence and the Internet of Things.					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises					
13.	Total available time fund	6 ECTS credits x 30 hours/credit = 180 hours				
14.	Distribution of the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours				
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	40 hours		
16.	Other forms of activities	16.1.	Project tasks	35 hours		
		16.2.	Independent tasks	35 hours		
		16.3.	Home study - tasks	35 hours		
17.	Method of assessment 80 + 15 + 5					
	17.1.	Tests		80 points		
	17.2.	Individual work / project (presentation: written and oral)		15 points		
	17.3.	Activity and participation		5 points		
18.	Assessment criteria (points / grade)	up to 50 points	5 (five) (F)			
		from 51 to 60 points	6 (six) (E)			
		from 61 to 70 points	7 (seven) (D)			
		from 71 to 80 points	8 (eight) (C)			
		from 81 to 90 points	9 (nine) (B)			
		from 91 to 100 points	10 (ten) (A)			
19.	Requirement for signature and taking the final exam	Students must ensure regular attendance of classes in accordance with the UINT regulations				
20.	Language of instruction	English, Macedonian				
21.	Method of monitoring the quality of teaching	Following the control procedures of UINT				
22.	Literature					
	22.1.	Mandatory literature				
		Serial number	Author	Title	Publisher	Year

		1.	Pedro Franco	Understanding Bitcoin – Cryptography, engineering, and economics	Wiley	2015
		2.				
		3.				
	22.2.	Additional literature				
		Serial number	Author	Title	Publisher	Year
		1.	Satoshi Nakamoto	Bitcoin: A Peer-to-Peer Electronic Cash System	Online source	2009
		2.				
		3.				

Elective No. 56	**Course program of the first, second and third cycle of studies**				
1.	Title of the course	Data Science			
2.	Code	ICS18E03			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – mandatory subject			
6.	Academic year / semester	4th year / 8th semester	7.	Number of ECTS credits	6
8.	Teacher	Asst. Prof. Ljubinka Sandjakoska, PhD			
9.	Prerequisites for enrolling in the course	none			
10.	Objectives of the course (competencies): · For students to gain knowledge about what data science is and in which domains it is applicable. · For students to be competent in creating data models and analyzing them. · To enable students to process data in order to extract knowledge/value for a company. · For students to be able to continue the concept of 'data engineering' and to be able to distinguish between the modern tasks of data engineering and data science (Eng. Data Science)				
11.	Course content: 1. Introduction to Data Science 2. Toolbox for Data Science 3. Descriptive statistics in Data Science 4. Statistical Inference 5. Unsupervised learning 6. Regression Analysis 7. Supervised learning 8. Network analysis 9. Recommender systems				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises				

13.	Total available time fund		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Distribution of the available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home study	35 hours

17.	Method of assessment 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Seminar paper / project (presentation: written and oral)	10 points
	17.3.	Activity and participation	10 points
18.	Assessment criteria (points / grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and taking the final exam	Students should regularly attend classes in accordance with the UINT regulations	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Following the control procedures of UINT	
	Literature		

	22.1	Mandatory literature				
		Serial	Author	Title	Publisher	Year

		number				
		1.	Joel Grus	Data Science from Scratch, 2nd Edition	O'Reilly Media, Inc. ISBN: 9781492041085	2019
		2.	Laura Igual, Santi Seguí	Introduction to Data Science A Python Approach to Concepts, Techniques and Applications	Springer	2017
	22.2	Additional literature				
		Serial number	Author	Title	Publisher	Year
		1.	Jake VanderPlas	Python Data Science Handbook: Essential Tools for Working with Data 2nd Edition	Elsevier ISBN: 9780128117606	2016

Elective No. 57	**Course program of the first, second and third cycle of studies**				
1.	Title of the course	Deep Learning			
2.	Code	ICS18E04			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	Fourth year / eighth semester	7.	Number of ECTS credits	6
8.	Teacher	Asst. Prof. Ljubinka Sandjakoska, PhD			
9.	Prerequisites for enrolling in the course	Machine Learning			
10.	Objectives of the course (competencies): For students to advance the concepts of machine learning and to delve into the specifics of deep learning. To become capable of creating various types of deep learning architectures as well as to master the ways of their optimization. Additionally, students should be able to solve practical problems by applying the methods used in deep learning artificial neural networks.				
11.	Course content: 7. Overview of basic machine learning concepts; linear algebra and probability used for deep learning 8. Introduction to deep learning; where it starts and what the trends are 9. Deep learning architectures ● Deep Feedforward Networks ● Convolutional Networks ● Sequence Modeling: Recurrent and Recursive Nets ● Autoencoders 10. Regularization 11. Optimization 12. Application ● Large-Scale Deep Learning				

	• Computer vision • Speech Recognition • Natural Language Processing				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises				
13.	Total available time fund		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Distribution of the available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home study	35 hours	
17.	Method of assessment 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper / project (presentation: written and oral)		10 points	
	17.3.	Activity and participation		10 points	
18.	Assessment criteria (points / grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and taking the final exam		Students should regularly attend classes in accordance with the UINT regulations		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Following the control procedures of UINT		

Literature

Mandatory literature

Serial number	Author	Title	Publisher	Year
1.	Ian Goodfellow, Yoshua Bengio, Aaron Courville	Deep Learning	The MIT Press	2016

Additional literature

Serial number	Author	Title	Publisher	Year
1.	Francois Chollet	Deep Learning with Python, Second Edition	Manning; 2nd edition	2021

Elective No.	**Course program of the first cycle of studies**

58						
1.	Title of the course	Offensive Security				
2.	Code	ICS18E05				
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences				
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle				
6.	Academic year / semester	4th year / 8th semester	7.	Number of ECTS credits	6	
8.	Teacher	Full Prof. Ustijana Rechkoska-Shikoska, PhD				
9.	Prerequisites for enrolling in the course	Passed state matura (secondary school diploma)				
10.	Objectives of the course (competencies): Upon completing this course, the student will be able to: 1. Examine the basic concepts and elements of cybersecurity from the perspective of people, processes and technologies 2. Encryption, Authentication, Authorization, Decryption, methods and application. 3. Examine the basic threats and protection mechanisms for physical, personal, computer and application-level security 4. Identify basic threats and protection mechanisms for Internet, network, mobile, wireless and web security 5. Apply the basic principles of information security in defense against cybersecurity threats and protect information devices 6. Cryptography 7. Block-Chain method and application					
11.	Course content: 1. Fundamentals of digital forensics – introduction to digital forensics, storage fundamentals, File system concepts, data recovery, Operating system software and basic terminology. Mobile device forensics. 2. Data and evidence recovery – Introduction to recovery of deleted files, recovery of a formatted partition, data recovery tools, Data recovery procedures and tools. Preservation and secure handling of the original files, documenting the "chain of custody", Complete timeline analysis of computer files based on file creation, file modification and file access. Recovery of data used from the Internet, Recovery of Swap files, Temporary files, Cache files. Introduction to Encase Forensic Edition, Forensic Tool Kit (FTK), etc. Using computer forensic software tools for cross-validation of findings in evidence-based computer cases. 3. Cybercrime – introduction to ICT law and cybercrime – Internet, Hacking, Cracking, Viruses, Virus attacks, Pornography, Software privacy, Intellectual property, Legal system of information technologies, Social engineering, mail bombs, Exploitation of vulnerabilities and cybersecurity. 4. Cyber forensic investigation – Introduction to cyber forensic investigation, Investigation tools, e-Discovery, Collection of digital evidence, Evidence protection, Email investigation, email tracking, IP address tracking, email recovery, Encryption and decryption methods, Locating and seizing computers, recovery of deleted evidence, password discovery. 5. Cybersecurity – Introduction to cybersecurity, Implementation of hardware-based security, Software-based Firewall, Security standards, Threat level assessment, Forming an incident response team, Reporting cybercrime, Operating system attacks, Application attacks, Reverse engineering and cracking techniques and Financial fraud. 6. Cryptography 7. Block-Chain method and application 8. Encryption, Authentication, Authorization, Decryption, methods and application. 9. Penetration testing with Kali Linux					
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of					

	exercises			
13.	Total available time fund		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Distribution of the available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home study	35 hours
17.	Method of assessment 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Seminar paper / project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points / grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and taking the final exam		Students must ensure regular attendance of classes in accordance with the UINT regulations	
20.	Language of instruction		English, Macedonian	
21.	Method of monitoring the quality of teaching		Following the control procedures of UINT	

Literature

Mandatory literature

	Serial number	Author	Title	Publisher	Year
22.1	1.	PWK	Penetration Testing with Kali Linux	OSCP,PWK Copyright © 2020 Offensive Security Ltd. All rights reserved	2020
	2.	LeClair, J.	Protecting our future: educating a cybersecurity workforce	Excelsior College Press, NY	2013
	3.	Michael G. Solomon K Rudolph, Ed Tittel Neil Broom, Diane Barrett	Computer Forensics, Jump Start,	Wiley Publishing, Inc.	2011
	4.	Petter Gottschalk	Policing Cyber Crime	Ist Edition, Petter Gottschalk	2010

22.2 Additional literature

		Serial number	Author	Title	Publisher	Year
		1.	Pfleeger, C.P.	Security in Computing	5th Edition, Prentice Hall	2010
		2.	AccessData	FTK Manager User Guide	AccessData Group, LLC. 384 South 400 West Suite 200 Lindon, Utah 84042 U.S.A. www.accessdata.com	2012
		3.				

Elective No. 59		**Course program of the first cycle of studies**			
1.	Title of the course	Virtual and Augmented Reality			
2.	Code	ICS18E06			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology “St. Paul the Apostle” - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the unit			
6.	Academic year / semester	Fourth year / eighth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dijana Capeska Bogatinoska, PhD			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the course (competencies): Through various combinations of lectures, discussions, practical examples, detailed presentations, students will become familiar with a number of interesting topics related to virtual (VR) and augmented reality (AR), 3D interaction and spatial user interfaces. Upon completing the course, students will be able to fully understand and use virtual and augmented reality, develop virtual 3D environments, develop virtual 3D applications. During the semester, students will also have the opportunity to develop a project.				
11.	Course content: 1. Introduction 2. Introduction to AR (Augmented reality)/VR (Virtual reality)/MR (Mixed reality)/XR (Extended reality): Technologies, Applications and Issues; XR Terminology and Application 3. XR Concepts and Technologies 4. Trends and open issues in XR 5. XR Strategy 6. User experience and interaction design for AR/VR/MR/XR - XR design process 7. Design, ethics and guidelines for XR				

	8. Storyboarding and physical prototypes for XR experiences 9. Digital prototyping and evaluation of XR experiences 10. Development of AR/VR/MR/XR applications with WebXR and introduction to Unity - XR approaches to application development 11. Development of VR applications 12. Development of AR applications 13. Special topics in XR				
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.				
13.	Total available time fund	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Distribution of the available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home study - tasks	35 hours	
17.	Method of assessment				
	17.1.	Tests		90 points	
	17.2.	Individual work / project (presentation: written and oral)		5 points	
	17.3.	Activity and participation		5 points	
18.	Assessment criteria (points / grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and taking the final exam		The student must ensure regular attendance of classes in accordance with the UINT regulations		
20.	Language of instruction		English, Macedonian		
21.	Method of monitoring the quality of teaching		Following the control procedures of UINT		
22.	Literature				
	22.1.	Mandatory literature			
		Serial number	Author	Title	Publisher	Year

		1.	Ralf Doerner (Editor), Wolfgang Broll (Editor), Paul Grimm (Editor), Bernhard Jung (Editor)	Virtual and Augmented Reality (VR/AR): Foundations and Methods of Extended Realities (XR)	Springer; 1st ed. 2022 edition	2022
		2.				
		3.				
	22.2.	Additional literature				
		Serial number	Author	Title	Publisher	Year
		1.	Bernard Marr	Extended Reality in Practice: 100+ Amazing Ways Virtual, Augmented and Mixed Reality Are Changing Business and Society	Wiley; 1st edition	2021
		2.				
		3.				

Elective No. 60	**Course program of the first, second and third cycle of studies**				
1.	Title of the course	Natural Language Processing			
2.	Code	ICS18E07			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology “St. Paul the Apostle” - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	4th year / 8th semester	7.	Number of ECTS credits	6
8.	Teacher	Anis Sefidanoski, PhD			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the course (competencies): Upon completing the course, students will be able to elaborate and apply the basic algorithms and techniques in the field of natural language processing (NLP).				

11.	Course content: - Understanding the approaches to the syntax and semantics of NLP technologies - Understanding the approaches to discourse, generation, dialogue and summarization of results within NLP - Understanding the current methods for statistical approaches to machine translation - Mastering machine learning techniques in NLP, including “Hidden Markov” models and context-free grammars, clustering and unsupervised learning methods, log-linear and discriminative models, as well as application of the EM algorithm in NLP.			
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by a case study, consultations with the course professor and project development			
13.	Total available time fund		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Distribution of the available time		Lectures: 45 hours; Consultations: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Consultations	30 hours
16.	Other forms of activities	16.1.	Project development	35 hours
		16.2.	Case study	35 hours
		16.3.	Home study	35 hours
17.	Method of assessment 50 + 25 + 20 + 5			
	17.1.	Final exam		50 points
	17.2.	Colloquium		25 points
	17.2.	Project (presentation: written and oral)		20 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points / grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)

		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and taking the final exam	Students must ensure regular attendance of classes in accordance with the UINT regulations	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Following the control procedures of UINT	

	Literature					
	22.1	Mandatory literature				
		Serial number	Author	Title	Publisher	Year
		1.	Lewis Tunstall, Leandro von Werra, Thomas Wolf	Natural Language Processing with Transformers, Revised Edition	O'Reilly Media	2022
		2.				
		3.				
	22.2	Additional literature				
		Serial number	Author	Title	Publisher	Year
		1.	Ekaterina Kochmar	Getting Started with Natural Language Processing	Manning Publications Co.	2022
		2.				
		3.				

University elective No. 1	**Course program of the first, second and third cycle of studies**				
1.	Title of the course	Digital Art			
2.	Code	CNS13U01			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology “St. Paul the Apostle” - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	2nd year / 3rd semester	7.	Number of ECTS credits	6

8.	Teacher		Assoc. Prof. Jane Bakreski, PhD		
9.	Prerequisites for enrolling in the course				
10.	Objectives of the course (competencies): The goal of the course is to familiarize students with the current digital principles and practices applied in contemporary artistic production. The course focuses on digital photography, image editing, compositing and photomontage, vector graphics and the basics of 3D modeling.				
11.	Course content: • Introduction to digital art o The artist and technology o Digital media and the new creative renaissance o Specificity of media and the post-media condition o Categories in digital art • Digital photography o Defining the digital photo camera o Concepts and processes of photography o Viewing through a photo camera – content and composition • Image editing o Introduction – digital image, image size, resolution, bit depth o Contrast and color o Compositing and photomontage • Vector graphics o Basics of vector graphics o Familiarization with the user interface and navigation of the vector graphics program o Familiarization with basic tools, creating basic shapes and modifying them o Advanced techniques for creating vector graphics (layers in vector graphics, using brushes, using the "Pen tool", using alignment tools, using color, gradients and patterns) o Application of vector graphics in design • Basics of 3D modeling o Familiarization with the user interface and navigation of the Autodesk Maya program o Creating basic geometric bodies and modifying them				
12.	Learning methods:				
13.	Total available time fund		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Distribution of the available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, home work: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other forms of activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Home study	35 hours	
17.	Method of assessment				
	17.1.	Tests		50 points	
	17.2.	Seminar paper / project (presentation: written and oral)		40 points	
	17.3.	Activity and participation		10 points	
18.	Assessment criteria (points / grade)		up to 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	

		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and taking the final exam	Students must ensure regular attendance of classes in accordance with the UINT regulations	
20.	Language of instruction	English, Macedonian	
21.	Method of monitoring the quality of teaching	Following the control procedures of UINT	

22. Literature

Mandatory literature

	Serial number	Author	Title	Publisher	Year
22.1.	1.	Richard Lewis and James Luciana	Digital Media: An Introduction	Prentice Hall	2004
	2.	Christiane Paul	Digital Art	Thames & Hudson	2015
	3.	Barbara London, Jim Stone and John Upton	Photography	Pearson	2016

Additional literature

	Serial number	Author	Title	Publisher	Year
22.2.	1.	Les Pardew and Don Seegmiller	Mastering Digital 2D and 3D Art	Thomson Course Technology	2004
	2.	Andy Beane	3D Animation Essentials	John Wiley & Sons	2012
	3.				

University elective No. 2		**Course program of the first cycle of studies**			
1.	Title of the course	Ethics of Electronic Literature			
2.	Code	ICS13U01			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Science and Technology “St. Paul the Apostle” - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list			
6.	Academic year / semester	Second year / third semester	7.	Number of ECTS credits	6
8.	Teacher	Asst. Prof. Mersiha Ismajloska, PhD			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the course (competencies): For students to acquire the basic terms of ethics as a fundamental philosophical discipline, its subject, methods and basic teachings, the categories of ethics and the basic ethical values, the role of reason and feelings in the ethical sphere, as well as the contemporary manifestations in morality and ethics. Analysis of ethical consequences: for students to critically analyze the ethical consequences arising from the creation, distribution and consumption of digital literature. Students will explore various ethical issues, such as cultural representation, privacy issues, digital accessibility and intellectual property rights. Examination of cultural and social impact: students will explore how digital literature affects culture and society. The goal of the course is to encourage discussions about how digital literature shapes collective values, beliefs and perspectives, and how it affects the spread of ideas in the digital world. Support for inclusivity and accessibility: students will explore the importance of inclusivity and accessibility in digital literature. The goal of the course is to raise awareness of the barriers faced by different user groups, and students will be encouraged to create works of digital literature that are accessible to everyone.				
11.	Course content: Introduction to electronic literature Definition and characteristics of electronic literature Introduction to the main ethical theories Analysis of the ethical challenges in cultural representation in electronic literature Understanding copyright rules and usage rights in the digital context Understanding the importance of accessibility in electronic literature for different user groups Ethical challenges related to content generated by artificial intelligence Addressing the issues of content moderation and the fight against disinformation Analyzing the role of digital platforms in shaping the visibility and accessibility of content				
12.	Learning methods: Lectures and discussions, review of specific cases from the field of e-ethics, examples from science fiction literature and connecting with theories in electronic ethics. Method of oral presentation, method of discourse, method of independent work.				

13.	Total available time fund	300 hours		
14.	Distribution of the available time	45+30+225=300		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching.	45h
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30h
16.	Other forms of activities	16.1.	Project tasks	100h
		16.2.	Independent tasks	65h
		16.3.	Home study - tasks	65h

17.	Method of assessment		
	17.1.	Tests	2x40=80 points
	17.2.	Individual work / project (presentation: written and oral)	10 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points / grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and taking the final exam		
20.	Language of instruction	English and Macedonian	
21.	Method of monitoring the quality of teaching		

22.	Literature					
	22.1.	Mandatory literature				
		Serial number	Author	Title	Publisher	Year
		1.	Singer Piter	Practical Ethics	Cambridge University Press; 3rd edition	2011
		2.	Scott Rettberg	Electronic Literature	Polity Press	2018
		3.	Stuart Russell, Peter	Artificial Intelligence:	Pearson; 3rd	2009

			Norvig	A Modern Approach 3rd Edition	edition	
	22.2.	Additional literature				
		Serial number	Author	Title	Publisher	Year
		1.	Immanuel Kant, Abbott Thomas Kingsmill	Critique of Practical Reason (Dover Philosophical Classics)	Dover Publications; 1st Pub 2004 edition	2004
		2.	John Cayley	Grammalepsy: Essays on Digital Language Art	Bloomsbury Publishing	2018
		3.				

University Elective No. 3		**Course Program – first First Cycle Studies**			
1.	Course Title	Creative Writing for Media			
2.	Code	ICS13U02			
3.	Study Program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology “St. Paul the Apostle” – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle – university elective course			
6.	Academic Year / Semester	Second year / Third semester	7.	Number of ECTS Credits	6
8.	Instructor	Asst. Prof. Dr. Mersiha Ismajloska			
9.	Prerequisites for Enrollment				
10.	Course Objectives (Competencies): The aim of this course is to demonstrate the importance of electronic media. Students will have the opportunity to prepare for a successful career in media-related fields. The focus is on how media shapes contemporary life.				
11.	Course Content: Introduction to Creative Writing Understanding the Basics of Creative Writing Exploring Different Forms of Creative Expression in Media Writing for Television Writing for Film Writing for Radio Writing for Online Platforms Writing for Journalism Exploring Ethical Challenges in Media Reporting				

	Writing for Advertising and Marketing Understanding Interactive Storytelling and Game Narratives Creating Branching Stories and Multiple Endings for Games Exploring the Use of Immersive Storytelling in Virtual Reality and Augmented Reality Writing for Social Media				
12.	Teaching Methods: Oral presentation method, independent work method. Participation of field experts. Visits to media institutions.				
13.	Total Available Time	180 hours			
14.	Distribution of Available Time	45+30+105=180			
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction.	45	
		Exercises (laboratory, classroom), seminars, teamwork.		30	
16.	Other Forms of Activities	16.1.	Project Tasks	35	
		16.2.	Independent Tasks	35	
		16.3.	Home Study – Assignments	35	
17.	Assessment Method				
	17.1.	Tests		20x40 = 80 points	
	17.2.	Individual work / Project (presentation: written and oral)		10 points	
	17.3.	Activity and Participation		10 points	
18.	Kriteria for Grading (points / grade)		up to 50 points	5 (five) (F)	
			51 to 60 points	6 (six) (E)	
			61 to 70 points	7 (seven) (D)	
			71 to 80 points	8 (eight) (C)	
			81 to 90 points	9 (nine) (B)	
			91 to 100 points	10 (ten) (A)	
19.	Condition for Signature and Final Exam				
20.	Language of Instruction	English and Macedonian			
21.	Teaching Quality Monitoring Method				
22.	Literature				
	22.1.	Required Literature			
		No.	Author	Title	Publisher	Year

		1.	Barthes, Roland	Introduction to the Structural Analysis of Narrative	Trans. Lionel Duisit. New Literary History: A Journal of Theory and Interpretation	1978
		2.	Norman J. Medoff, Barbara Kaye	Electronic Media: Then, Now, and Later	Routledge; 3rd edition	2017
		3.	Natalie Fenton	New Media, Old News: Journalism And Democracy In The Digital Age	SAGE Publications Ltd; 1st edition	2009
	22.2.	Additional Literature				
		No.	Author	Title	Publisher	Year
		1.	Lessig, Lawrence	Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity	The Penguin Press	2004
		2.				
		3.				

University Elective No. 4		**Course Program – first First Cycle Studies**			
1.	Course Title	Democracy and Technology			
2.	Code	MIR13U02			
3.	Study Program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology “St. Paul the Apostle” – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle – university elective course			
6.	Academic Year / Semester	Second year / Third semester	7.	Number of ECTS Credits	6
8.	Instructor	Asst. Prof. Dr. Goran Shibakowski			
9.	Prerequisites for Enrollment	None			
10.	Course Objectives (Competencies): Students will receive an introduction to the concept of democracy and technology, and will become familiar with models and ways in which the internet opens new opportunities for democratic participation. They will also be equipped to assess the development of democracy and technology globally and identify its future challenges. Additionally, students will acquire skills for implementing technological tools to advance democracy in society.				
11.	Course Content: 1. Introduction to the course. 2. Democracy and Technology. 3. Democratic eco-				

	systems and models in the world. 4. Democracy and Technology in Europe – Estonia as a model. 5. Effects and impact of ICT on democratic processes and development. 6. Participation and types of interaction under conditions of democracy and technology. 7. Democracy, political organization, and technology. 8. Democracy, the state, society, and technological change. 9. Democracy and Technology: security, privacy, and trust. 10. Internet censorship and democracy. 11. Democracy and technology in developed and developing countries. 12. The state of democracy and technology in North Macedonia. 13. Challenges of democracy and the development of technology in the world.				
12.	Teaching Methods: Lectures and theoretical instruction, exercises, independent seminar work, teamwork in groups, project and independent tasks, home study, consultations.				
13.	Total Available Time	6 ECTS x 30 hours/credit = 180 hours			
14.	Distribution of Available Time	45+30+35+35+35 = 180 hours			
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other Forms of Activities	16.1.	Project Tasks	35 hours	
		16.2.	Independent Tasks	35 hours	
		16.3.	Home Study – Assignments	35 hours	
17.	Assessment Method				
	17.1.	Tests		80 points	
	17.2.	Individual work / Project (presentation: written and oral)		10 points	
	17.3.	Activity and Participation		10 points	
18.	Kriteria for Grading (points / grade)		up to 50 points	5 (five) (F)	
			51 to 60 points	6 (six) (E)	
			61 to 70 points	7 (seven) (D)	
			71 to 80 points	8 (eight) (C)	
			81 to 90 points	9 (nine) (B)	
			91 to 100 points	10 (ten) (A)	
19.	Condition for Signature and Final Exam	Regular attendance in accordance with UIST regulations			
20.	Language of Instruction	English, Macedonian			
21.	Teaching Quality Monitoring Method	Self-evaluation and UIST teaching quality monitoring mechanisms			
22.	Literature				
	22.1.	Required Literature			
		No.	Author	Title	Publisher	Year
		1.	Vaccari, Cristian;	Ouside the Bubble:	Oxford	2021

			Augusto Valeriani	Social Media and Political Participation in Western Democracies	University Press	
		2.	Contucci, Perluigi, Andrea Omicini (Eds.)	The Future of Digital Democracy. An Interdisciplinary Approach.	Springer	2019
		3.				
	22.2.	Additional Literature				
		No.	Author	Title	Publisher	Year
		1.	Lindner, Ralf, Georg Aichholzer, Leonard Hennen	Electronic Democracy in Europe. Prospects and Challenges of E-Publics, E-Participation and E-Voting.	Springer	2016
		2.	Vaccari, Cristian	Digital Politics in Western Democracies. A Comparative Study	Johns Hopkins University Press	2013
		3.				

University Elective No. 5		**Course Program – first First Cycle Studies**			
1.	Course Title	Open Data			
2.	Code	MIR13U03			
3.	Study Program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology “St. Paul the Apostle” – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle – university elective course			
6.	Academic Year / Semester	Second year / Third semester	7.	Number of ECTS Credits	6
8.	Instructor	Asst. Prof. Dr. Goran Shibakowski			
9.	Prerequisites for Enrollment	None			
10.	Course Objectives (Competencies): The aim of this course is to build students' capacity to understand the value of open data and to use open data. Through this course, students will learn about open data and its benefits, the technical characteristics of working with open data, the global open data movement and current trends, and ways of working with open data worldwide.				
11.	Course Content: 1. Introduction to the course. 2. Open definition and open data – meaning and				

	government information opening principles. 3. Open data legislation, policies, and licensing. 4. Open data sources – government and other sources. 5. Open data case studies – government and civil society initiatives. 6. Data cleaning process – common errors and elements. 7. Data extraction – software, limitations, and challenges. 8. Open data analysis – data structures, variables, qualitative and quantitative analysis. 9. Open data visualization – meaning and software/tools. 10. Publishing open data – portals, licensing, formats, and data storytelling. 11. Open data portals – international examples and case studies. 12. Overview of the open data ecosystem in North Macedonia. 13. Global trends and challenges in open data.				
12.	Teaching Methods: Lectures and theoretical instruction, exercises, independent seminar work, teamwork in groups, project and independent tasks, home study, consultations.				
13.	Total Available Time	6 ECTS x 30 hours/credit = 180 hours			
14.	Distribution of Available Time	45+30+35+35+35 = 180 hours			
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction.	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Other Forms of Activities	16.1.	Project Tasks	35 hours	
		16.2.	Independent Tasks	35 hours	
		16.3.	Home Study – Assignments	35 hours	
17.	Assessment Method				
	17.1.	Tests		80 points	
	17.2.	Individual work / Project (presentation: written and oral)		10 points	
	17.3.	Activity and Participation		10 points	
18.	Kriteria for Grading (points / grade)		up to 50 points	5 (five) (F)	
			51 to 60 points	6 (six) (E)	
			61 to 70 points	7 (seven) (D)	
			71 to 80 points	8 (eight) (C)	
			81 to 90 points	9 (nine) (B)	
			91 to 100 points	10 (ten) (A)	
19.	Condition for Signature and Final Exam		Regular attendance in accordance with UIST regulations		
20.	Language of Instruction		English and Macedonian		
21.	Teaching Quality Monitoring Method		Self-evaluation and UIST teaching quality monitoring mechanisms		
22.	Literature				
	22.1.	Required Literature			
		No.	Author	Title	Publisher	Year

		1.	Charalabidis, Yannis and Anneke Zuiderwijk, et al.	The World of Open Data: Concepts, Methods, Tools and Experiences	Springer	2018
		2.				
		3.				
	22.2.	Additional Literature				
		No.	Author	Title	Publisher	Year
		1.	Davies, Tim, Walker, Stephen B., Rubinstein, Mor	The State of Open Data: Histories and Horizons	African Minds	2019
		2.	Bolívar, Manuel Pedro Rodríguez and Kelvin Joseph Bwalya, et al.	Governance Models for Creating Public Value in Open Data Initiatives	Springer	2019
		3.				

University Elective No. 6		**Course Program – first First Cycle Studies**			
1.	Course Title	Law in Information Technologies			
2.	Code	MIR13U01			
3.	Study Program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology "St. Paul the Apostle" – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle			
6.	Academic Year / Semester	2nd year / 3rd semester	7.	Number of ECTS Credits	6
8.	Instructor	Dr. Ivan Bimbilovski			
9.	Prerequisites for Enrollment	Completed state school-leaving exam (matura)			
10.	Course Objectives (Competencies): By the end of the semester, students will be able to: • Critically analyze complex legal issues and challenges related to the application of information technologies, propose well-founded solutions and conclusions, and present them persuasively in written and oral form. • Independently research and study primary and secondary sources of IT law, critically analyze, interpret, evaluate, and synthesize information obtained from those sources; identify additional research sources and develop a research strategy using classical and electronic research tools and methods.				
11.	Course Content: This course is primarily a legal program adapted to the specifics of the Digital Business Informatics study program and explores legal challenges arising from the application of information technologies in: intellectual property, data protection, business operations, contracts, liability for damages, criminal offenses, human rights and ethics – particularly from a constitutional-law perspective. Topics include: global governance in cyberspace; judicial jurisdiction and procedure in cyberspace; contract law in IT; consumer protection law in IT; liability for damages in IT; privacy law in IT; criminal offenses and misdemeanors committed via IT; legal regulation of internet content and cyberspace (constitutional principles of freedom of speech applied to IT); protection of				

	copyright, trademarks, trade secrets, and patents in IT; legal regulation of electronic and digital signatures; legal regulation of cryptocurrencies and cyberspace payments, etc.				
12.	Teaching Methods: This course is based on 45 hours of lectures supplemented by 30 hours of exercises				
13.	Total Available Time		6 ECTS credits x 30 hours/credit = 180 hours		
14.	Distribution of Available Time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total 180 hours		
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours	
16.	Other Forms of Activities	16.1.	Project Tasks	35 hours	
		16.2.	Independent Tasks	35 hours	
		16.3.	Home Study	35 hours	
17.	Assessment Method 80 + 15 + 5				
	17.1.	Tests		80 points	
	17.2.	Seminar paper / Project (presentation: written and oral)		15 points	
	17.3.	Activity and Participation		5 points	
18.	Kriteria for Grading (points / grade)		up to 50 points	5 (five) (F)	
			51 to 60 points	6 (six) (E)	
			61 to 70 points	7 (seven) (D)	
			71 to 80 points	8 (eight) (C)	
			81 to 90 points	9 (nine) (B)	
			91 to 100 points	10 (ten) (A)	
19.	Condition for Signature and Final Exam		Students must ensure regular class attendance in accordance with UIST regulations		
20.	Language of Instruction		English, Macedonian		
21.	Teaching Quality Monitoring Method		Adherence to UIST quality control procedures		

Literature

22.1	Required Literature				
	No.	Author	Title	Publisher	Year
	1.	Michael L. Rustad	Global Internet Law, 4th Edition	West Academic Publishing	2019
Additional Literature	Additional Literature				
	No.	Author	Title	Publisher	Year
	1.	Andrej Savin	EU Internet Law, 3rd Edition	Edward Elgar Publishing	2020

University Elective No. 7		**Course Program – first First Cycle Studies**
1.	Course Title	English for Academic Purposes
2.	Code	ISVMA13U01
3.	Study Program	Digital Business Analytics / Faculty of Information and Communication

		Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology “St. Paul the Apostle” – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle – university elective course			
6.	Academic Year / Semester	Second year / Third semester	7.	Number of ECTS Credits	6
8.	Instructor	Lina Milosheska			
9.	Prerequisites for Enrollment				

10.	Course Objectives (Competencies): Students will be able to: ● Demonstrate and apply knowledge of basic essay structure, including introduction, body, and conclusion; ● Apply the various stages of the writing process, including pre-writing, writing, and re-secondwriting ● Apply descriptive, narrative, and expository modes of writing; ● ability to write for academic audiences ● Demonstrate understanding of effective paragraph principles and their application ● Write concise sentences; ● Apply citation, paraphrasing, and summarizing; ● Introduce a position and integrate source material into an essay; ● Recognize and correct basic grammatical errors, especially subject/verb agreement, verb tense, pronoun agreement, use of prepositions and articles ● Improve academic, professional, and idiomatic vocabulary; ● Apply socially appropriate language ● Read, analyze, and respond to assigned reading materials with understanding of structure and mechanics; ● Identify effective writing techniques in their own work and in the written work of peers. ● Apply correct MLA or APA rules, including quotation, in-text citation, and the works cited list. ● Evaluate sources for relevance and credibility ● Avoid plagiarism
11.	Course Content: The course introduces students to the practice of academic writing to prepare them for advanced-level English-language courses in which writing research projects is an integral component. Students become familiar with fundamental writing and research skills, including: conducting research, note-taking, paraphrasing, summarizing, direct quotation, analysis, synthesis and critical thinking and positioning, and MLA or APA citation rules. In addition, the course addresses macro-level writing skills such as: essay structure, paragraph structure, coherence, unity; and micro-level skills such as: sentence structure, grammar, vocabulary, spelling and mechanics.
12.	Teaching Methods: In this course various teaching and learning methods will be used, including lectures, discussions, written assignments, independent research, projects, homework, quizzes

13.	Total Available	6 ECTS credits x 30 hours/credit = 180 hours

	Time			
14.	Distribution of Available Time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total 180 hours		
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction.	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours
16.	Other Forms of Activities	16.1.	Project Tasks	35 hours
		16.2.	Independent Tasks	35 hours
		16.3.	Home Study – Assignments	35 hours

17.	Assessment Method 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Individual work / Project (presentation: written and oral)	15 points
	17.3.	Activity and Participation	5 points

18.	Kriteria for Grading (points / grade)	up to 50 points	5 (five) (F)
		51 to 60 points	6 (six) (E)
		61 to 70 points	7 (seven) (D)
		71 to 80 points	8 (eight) (C)
		81 to 90 points	9 (nine) (B)
		91 to 100 points	10 (ten) (A)

19.	Condition for Signature and Final Exam	Students must ensure regular class attendance in accordance with UIST regulations
20.	Language of Instruction	English
21.	Teaching Quality Monitoring Method	Adherence to UIST quality control procedures

22.	Literature					
	22.1.	Required Literature				
		No.	Author	Title	Publisher	Year
		1.	Adrian Wallwork, Anna Southern	100 Tips to Avoid Mistakes in Academic Writing and Presenting (English for Academic Research) 1 – 1st edition	Springer	2020
		2.	Roselyn Petelin	How Writing Works 2nd Edition – 2nd edition	Routledge	2022
		3.				
	22.2.	Additional Literature				

		No.	Author	Title	Publisher	Year
		1.	Irobiko Chimezie Kingsley	How to Write Professional Academic Research Proposals: + Sample Copies in Different Disciplines.	Lambert Academic Publishing	2020
		2.				
		3.				

University Elective No. 8	**Course Program – first, second and third Cycle Studies**				
1.	Course Title	The Art of Graphic Design			
2.	Code	CNS14U02			
3.	Study Program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology "St. Paul the Apostle" – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle			
6.	Academic Year / Semester	2nd year / 4th semester	7.	Number of ECTS Credits	6
8.	Instructor	Assoc. Prof. Dr. Jane Bakreski			
9.	Prerequisites for Enrollment				
10.	Course Objectives (Competencies): The aim of this course is to familiarize students with the form and function of graphic design. Students study the theory and principles of basic design, i.e. the principles of visual perception and their application in visual communication, combined with knowledge and skills for working with two-dimensional surfaces. Upon completing this course, students will know how to convey ideas through visualization and design.				
11.	Course Content: • Introduction to graphic design as artistic expression • Perception o Gestalt principles of visual organization o Semiotics o Figure – background • Vector graphics – application of vector graphics in graphic design • Dynamic balance o Visual dynamics o Achieving visual balance through the use of symmetry and asymmetry • Gestalt principles of organization in visual perception and their application in logo design o Whole and constituent parts o Gestalt principles (figure – ground, similarity, proximity, continuation, closure) o Studying the logo design process • Typography and layout of text-containing sections o History and development of written communication o History and development of typefaces, font types, and their characteristics o Use of fonts (font size, line length, vertical spacing between lines, formatting) o Creating a conceptual and graphic solution for a book • Creating a dynamic, unified publication design o Visual balance o Scale and proportions o Visual rhythm o Creating structure				

	○ Creating a conceptual and graphic solution for a brochure • Web design ○ Introduction to basic web design elements ○ Basic principles of user interface organization ○ Usability concepts in user interface interaction ○ Creating a website structure ○ Website design and prototype creation			
12.	Teaching Methods:			
13.	Total Available Time		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Distribution of Available Time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total 180 hours	
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 часови
16	Other Forms of Activities		Project Tasks	35 hours
		16.2.	Independent Tasks	35 hours
		16.3.	Home Study	35 hours
17.	Assessment Method			
	17.1.	Tests		50 points
	17.2.	Seminar paper / Project (presentation: written and oral)		40 points
	17.3.	Activity and Participation		10 points
18.	Kriteria for Grading (points / grade)		up to 50 points	5 (five) (F)
			51 to 60 points	6 (six) (E)
			61 to 70 points	7 (seven) (D)
			71 to 80 points	8 (eight) (C)
			81 to 90 points	9 (nine) (B)
			91 to 100 points	10 (ten) (A)
19.	Condition for Signature and Final Exam		Students must ensure regular class attendance in accordance with UIST regulations	
20.	Language of Instruction		English, Macedonian	
21.	Teaching Quality Monitoring Method		Adherence to UIST quality control procedures	

University Elective No. 9	**Course Program – first, second and third Cycle Studies**				
1.	Course Title	Visual Arts and 3D Modelling			
2.	Code	CNS14U03			
3.	Study Program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology “St. Paul the Apostle” – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle			
6.	Academic Year / Semester	2nd year / 4th semester	7.	Number of ECTS Credits	6
8.	Instructor	Assoc. Prof. Dr. Jane Bakreski			
9.	Prerequisites for Enrollment				
10.	Course Objectives (Competencies): The aim of this course is to study the basic concepts and creative processes of 3D modelling and				

	animation. Through instruction covering both the technical and artistic aspects of this field, as well as active use of leading industry software for 3D modelling and animation, Autodesk Maya и Adobe Photoshop, students will acquire the knowledge and skills needed to work in the computer games, computer animation, design, and advertising industries.			
11.	Course Content: • Introduction to the user interface and navigation of Autodesk Maya • Creating and modifying basic geometric shapes • Overview of geometry types for 3D modelling in Autodesk Maya (Polygons, NURBS and Subdivision Surfaces), along with the modelling techniques characteristic of each • Modelling three-dimensional objects and environments • Texturing and shading o Overview of different shader types and their basic characteristics o Creating textures for virtual 3D models using image o Mapping o Preparing textures in Adobe Photoshop • Setting up, lighting, and rendering a 3D scene • Introduction to 3D computer animation (“keyframe” animation) o Modelling and rigging a character for 3D animation o Creating animation poses o Adding motion to a character – introduction to Graph Editor and application of Disney animation principles			
12.	Teaching Methods:			
13.	Total Available Time		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Distribution of Available Time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total 180 hours	
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 часови
Other Forms of Activities	Други форми на активности	Other Forms of Activities	Project Tasks	35 hours
		16.2.	Independent Tasks	35 hours
		16.3.	Home Study	35 hours
17.	Assessment Method			
	17.1.	Tests		50 points
	17.2.	Seminar paper / Project (presentation: written and oral)		40 points
	17.3.	Activity and Participation		10 points
18.	Kriteria for Grading (points / grade)		up to 50 points	5 (five) (F)
			51 to 60 points	6 (six) (E)
			61 to 70 points	7 (seven) (D)
			71 to 80 points	8 (eight) (C)
			81 to 90 points	9 (nine) (B)
			91 to 100 points	10 (ten) (A)
19.	Condition for Signature and Final Exam		Students must ensure regular class attendance in accordance with UIST regulations	
20.	Language of Instruction		English, Macedonian	

21.	Teaching Quality Monitoring Method	Adherence to UIST quality control procedures

22.	Literature					
	22.1.	Required Literature				
		No.	Author	Title	Publisher	Year
		1.	Richard Lewis and James Luciana	Digital Media: An Introduction	Prentice Hall	2004
		2.	Paul Naas	Autodesk Maya 2014 Essentials: Autodesk Official Press	Sybex	2013
		3.	Andy Beane	3D Animation Essentials	John Wiley & Sons	2012
	22.2.	Additional Literature				
		No.	Author	Title	Publisher	Year
		1.	William Vaughan	Digital Modeling	New Riders Pub	2011
		2.	Ollie Johnston and Frank Thomas	The Illusion of Life: Disney Animation	Disney Editions	1995
		3.				

University Elective No. 10		**Course Program – first First Cycle Studies**			
1.	Course Title	Theory of Culture			
2.	Code	ICS14U03			
3.	Study Program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology "St. Paul the Apostle" – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle – university elective course			
6.	Academic Year / Semester	Second year / Fourth semester	7.	Number of ECTS Credits	6
8.	Instructor	Asst. Prof. Dr. Mersiha Ismajloska			
9.	Prerequisites for Enrollment				
10.	Course Objectives (Competencies): Presentation of key theoretical perspectives Exploring the concept of culture Analysis of cultural production and consumption Exploring cultural identities Analysis of globalization and cultural hybridity Discussion of power and cultural hegemony Engaging with cultural texts and artefacts Exploring the politics of culture				
11.	Course Content: Introduction to cultural studies and theory of culture Definitions of culture and cultural theory Influence of culture on individual and collective identities Cultural determinants of social and political processes Relationship between culture and personal/cultural transformation Performance of culture and representation of cultural artefacts Mass culture and its impact on society Production and reproduction of culture through media and technology Politics of culture and cultural activism: Engagement of civic and academic communities in cultural activism Cultural policy and its impact on identities and social movements Intercultural ethics and cultural responsibility: Ethical challenges in representing and interpreting other cultures Cultural responsibility of cultural content creators Promoting intercultural cooperation and cultural exchange				
12.	Teaching Methods: Lectures and discussions. Practical work. Constant collaboration with online portals. Monitoring global trends.				
13.	Total Available Time	180 hours			

14.	Distribution of Available Time	45+30+105=180		
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction.	45
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30
16.	Other Forms of Activities	16.1.	Project Tasks	35
		16.2.	Independent Tasks	35
		16.3.	Home Study – Assignments	35

17.	Assessment Method		
	17.1.	Tests	2 x 40 = 80 points
	17.2.	Individual work / Project (presentation: written and oral)	10 points
	17.3.	Activity and Participation	10 points

18.	Kriteria for Grading (points / grade)	up to 50 points	5 (five) (F)
		51 to 60 points	6 (six) (E)
		61 to 70 points	7 (seven) (D)
		71 to 80 points	8 (eight) (C)
		81 to 90 points	9 (nine) (B)
		91 to 100 points	10 (ten) (A)

19.	Condition for Signature and Final Exam	
20.	Language of Instruction	English, Macedonian
21.	Teaching Quality Monitoring Method	

22. Literature

22.1. Required Literature

No.	Author	Title	Publisher	Year
1.	Edward S. Herman, Noam Chomsky	Manufacturing Consent: The Political Economy of the Mass Media	Pantheon Books	1988
2.	Kiran Prasad	E-journalism New Media and News Media	B.r. Publishing Corporation	2011
3.	E. B White	Essays of E. B. White (Perennial Classics)	Harper Perennial Modern Classics; Reprint edition	2006

	22.2.	Additional Literature				
		No.	Author	Title	Publisher	Year
		1.	Richard Lewis, James Luciana	Digital Media: An Introduction	Prentice Hall; 1st edition	2004
		2.	Joe Lambert	Digital Storytelling: Capturing Lives, Creating Community (Digital Imaging and Computer Vision)	Routledge; 4th edition	2012
		3.				

University Elective No. 11		**Course Program – first First Cycle Studies**			
1.	Course Title	Literary Theories in Journalism			
2.	Code	ICS14U04			
3.	Study Program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology “St. Paul the Apostle” – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle – university elective course			
6.	Academic Year / Semester	Second year / Fourth semester	7.	Number of ECTS Credits	6
8.	Instructor	Asst. Prof. Dr. Mersiha Ismajloska			
9.	Prerequisites for Enrollment				
10.	Course Objectives (Competencies): Within the theoretical part of the course, students will learn about the main characteristics of the development of journalism. Particular attention will be paid to personal data protection, e-commerce, cybercrime, authorship rights and the internet, the digital public sphere, etc. Within the practical part of the course, students will be trained to search for relevant information in cyberspace, use databases, work with word-processing software, and understand the basics of electronic and interactive journalism, etc. Students will learn the characteristics of journalism in print and electronic media. Media models worldwide. The production of print media and the impact of technology. Aspects affecting print media such as the market and marketing, monopolies, and media magnates. The internet as a medium and its strong influence on other media.				
11.	Course Content: Theoretical and practical approach to the study of print as a medium and its specificities. Characteristics of journalism in print media. Media models in the world. Production of print media and the impact of technology. Aspects affecting print media: market and marketing. Monopolies and media magnates. The internet as a new medium and its strong influence on other media.				
12.	Teaching Methods:				

13.	Total Available Time	300h		
14.	Distribution of Available Time	45+30+225=300		
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction.	45h
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 h
16.	Other Forms of Activities	16.1.	Project Tasks	100h
		16.2.	Independent Tasks	65h
		16.3.	Home Study – Assignments	60h

17.	Assessment Method		
	17.1.	Tests	2x40=80 points
	17.2.	Individual work / Project (presentation: written and oral)	10 points
	17.3.	Activity and Participation	10 points

18.	Kriteria for Grading (points / grade)	up to 50 points	5 (five) (F)
		51 to 60 points	6 (six) (E)
		61 to 70 points	7 (seven) (D)
		71 to 80 points	8 (eight) (C)
		81 to 90 points	9 (nine) (B)
		91 to 100 points	10 (ten) (A)

19.	Condition for Signature and Final Exam	
20.	Language of Instruction	English, Macedonian
21.	Teaching Quality Monitoring Method	

22. Literature

22.1. Required Literature

No.	Author	Title	Publisher	Year
1.	Kiran Prasad	E-journalism New Media and News Media	B.r. Publishing Corporation	2011
2.	E. B White	Essays of E. B. White (Perennial Classics)	Harper Perennial Modern Classics; Reprint edition	2006
3.				

22.2. Additional Literature

		No.	Author	Title	Publisher	Year

University elective No. 12		**First cycle study program**			
1.	Title on the teaching subject	Diplomacy in the modern time			
2.	Code	MIR14U04			
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list			
6.	Academic year / semester	Second year / quarter semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Dr. Goran Šibakovski			
9.	Prerequisites for enrolling in the course	There is none.			
10.	Course objectives (competencies): Diplomatic activities are increasingly supported by the Internet and modern technologies. This course focuses on the opportunities and challenges offered by modern tools for diplomatic activities. It also explores the policy implications inherent in these processes. Through this course, students will be equipped with the skills to review, describe and analyze the current and potential use of modern tools for diplomatic activities. Students will also be able to propose guidelines for the appropriate use of social media and other Internet tools in diplomatic activities, and especially in the approximation of public diplomacy and the organization of effective diplomatic campaigns using such tools.				
11.	Course content: 1. Introduction to the subject. 2. Research on diplomacy in modern times: phenomenon, actors, definitions and practices. 3. Diplomacy and problems in the Internet space. New topics and tools for diplomatic activities. 4. Diplomacy, security and policies in cyberspace. 5. Modern Diplomacy: Political Analysis and Consular Protection. 6. Modern diplomacy. Communication during a diplomatic crisis. Internet tools in negotiations. 7. The Internet and Public Diplomacy – Overview, Algorithms and Social Media. 8. Internet management and information work. Data diplomacy. 9. Diplomacy and Artificial Intelligence. Understanding Artificial Intelligence. 10. Modern technologies, diplomats and the Ministry of Foreign Affairs. Diplomats in the Internet space. 11. Case studies of best practices of modern diplomacy around the world. 12. Status, topics and challenges for the development of modern diplomacy in the Republic of Macedonia. 13. Diplomacy and international relations in modern times. Expansion of virtual space. Challenges facing diplomacy in modern times.				
12.	Learning methods: Lectures and theoretical teaching, exercises, independent seminar work, teamwork in groups, project and independent assignments, homework, consultations.				
13.	Total available fund on time	6 EXT x 30 hours/credit = 180 hours			

14.	Distribution on the available time	45+30+35+35+35 = 180 hours		
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours
16.	Others forms on activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Homemade learning - tasks	35 hours

17.	Way on assessment		
	17.1.	Tests	80 points
	17.2.	Individual work/project (presentation: written and oral)	10 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		51 x to 60 points	6 (six) (E)
		61 x to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)

19.	Requirement for signature and passing the final exam	Regular attendance at classes in accordance with UINT regulations
20.	Language of instruction	English , Macedonian
21.	Method of monitoring the quality of teaching	Self-evaluation and mechanisms for monitoring the quality of teaching at UINT

22. Literature

22.1.	Mandatory literature				
	Serial number	A second	Title	Publisher	Year
	1.	Marzouki , Meryem and Andrea Calderaro	Internet Diplomacy: Shaping the Global Politics of Cyberspace	Rowman & Littlefield	2022
	2.				
	3.				
22.2.	Additional literature				
	Ordinal number	A second	Title	Publisher	Year
	1.	Manor, Ilan	The Digitalization of	Palgrave	2019

				Public Diplomacy	Macmillan	
		2.				
		3.				

University elective No. 13	**Subject program from the first , second and third cycle of studies**				
1.	Title of the course	2D and 3D techniques for concept art			
2.	Code	CNS15U05			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year/semester	3rd year /5th semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Jane Bakreski			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): The goal of the course is to study the basic concepts and creative processes of 2D and 3D visualization, a technique also known as matte painting. Students begin by modeling, texturing, lighting, placing, and rendering three-dimensional scenes , then continue to polish those scenes in 2D painting programs , such as Adobe Photoshop . The course program allows students to develop all their creative ideas, translating them into incredible fictional landscapes. The end result is the creation of complex, photorealistic scenes, which are an important part of the computer game industry, the film industry, etc.				
11.	Course content: • Advanced 3D modeling techniques • Modeling a three-dimensional environment o Using references o 3D sketching o Modeling on complex three-dimensional objects o Creation on nature • Texturing and shading o Introduction to the different types of shaders and their basic characteristics o Creating textures of virtual 3D models using an image o Mapping o Preparing textures in Adobe Photoshop o Advanced texturing techniques (mapping complex objects, alpha mapping) • 3D scene lighting o Lighting with "Physical" Sky o Creating an " atmosphere volume " using Arnold o Image-based lighting • 2D rendering – creating a " render" passes " • Importing and composing " render" passes ” in Adobe Photoshop. • 2D painting in Adobe Photoshop and finishing the digital image				
12.	Learning methods:				
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework work: 105 hours = Total time of 180 hours			
15.	Forms of teaching activities	15.1	Lectures - theoretical	45 hours	

		.	teaching	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17.	Method of assessment		
	17.1.	Tests	50 points
	17.2.	Seminar paper/project (presentation: written and oral)	40 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English , Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

22.	Literature					
	22.1.	Required literature				
		Seria	A second	Title	Publisher	Year
		1.	Les Pardew and Don Seegmiller	Mastering Digital 2D and 3D Art	Thomson Course Technology	2004
		2.	David Franson	2D Artwork and 3D Modeling for Game Artists	Premier Press	2003
		3.				
	22.2.	Additional literature				
		Seria number	A second	Title	Publisher	Year
		1.	Richard Lewis and James Luciana	Digital Media: An Introduction	Prentice Hall	2004

<table>
<tr><td colspan="2">University elective No. 14</td><td colspan="6">Subject program from the first , second and third cycle of studies</td></tr>
<tr><td>1.</td><td colspan="2">Title of the course</td><td colspan="5">Introduction to New Media Art</td></tr>
<tr><td>2.</td><td colspan="2">Code</td><td colspan="5">CNS15U04</td></tr>
<tr><td>3.</td><td colspan="2">Study program</td><td colspan="5">Digital Business Analytics / Faculty of Information and Communication Sciences</td></tr>
<tr><td>4.</td><td colspan="2">Organizer of the study program (unit, i.e. institute, department, division)</td><td colspan="5">University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid;
Faculty of Information and Communication Sciences</td></tr>
<tr><td>5.</td><td colspan="2">Degree (first, second, third cycle)</td><td colspan="5">First cycle</td></tr>
<tr><td>6.</td><td colspan="2">Academic year/semester</td><td colspan="2">3rd year /5th semester</td><td>7.</td><td>Number of ECTS credits</td><td>6</td></tr>
<tr><td>8.</td><td colspan="2">Teacher</td><td colspan="5">Assoc. Prof. Dr. Jane Bakreski</td></tr>
<tr><td>9.</td><td colspan="2">Prerequisites for enrolling in the course</td><td colspan="5"></td></tr>
<tr><td>10.</td><td colspan="7">Objectives of the subject program (competencies):
Digital technology undoubtedly influences the way we create art today. The digital age offers us a vast array of creative tools and countless artistic forms of expression. Furthermore, new technology has brought new media that have challenged traditional understandings of the terms medium, artwork, artist, and audience, and have had a critical impact on older, non-technological media, such as painting, drawing, or sculpture. The aim of the course is to provide an overview of the many forms of digital art and new media, the essential characteristics of their aesthetics, and their technological and art-historical evolution.</td></tr>
<tr><td>11.</td><td colspan="7">Course content:
• History of technology and art
o The artist and technology in the past
o Specificity of the medium
o Digital media and the new creative renaissance
o Hypertext and hypermedia
o Information space and interface, bitmapping, graphics window and direct manipulation via a computer mouse
o The influence of modernist art movements on digital arts
o Streaming media and interaction
• Digital visualization (digital technology as a tool)
o Shapes generated by mathematical functions
o Compositing and collage – recontextualization and assimilation of artistic ideas
o Image manipulation
o Advertisement
o Alternative forms of reality
o Beyond naturalism and computer-generated nature
o Visualizing a process – translating and encoding visual information
o Computer-aided image creation
• Digital technology as a medium
o Forms of digital art
o Digital installation
o Internet art, network art and software art
o Virtual reality
o Changes in optical perception and consciousness</td></tr>
<tr><td>12.</td><td colspan="7">Learning methods:</td></tr>
<tr><td>13.</td><td colspan="3">Total available fund on time</td><td colspan="4">6 ECTS credits x 30 hours/credit = 180 hours</td></tr>
<tr><td>14.</td><td colspan="3">Allocation of available time</td><td colspan="4">Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework work: 105 hours = Total time of 180 hours</td></tr>
<tr><td rowspan="2">15.</td><td rowspan="2">Forms of teaching activities</td><td>15.1.</td><td colspan="3">Lectures - theoretical teaching</td><td>45 hours</td></tr>
<tr><td>15.2</td><td colspan="3">Exercises (laboratory,</td><td>30 hours</td></tr>
</table>

		.	classroom), seminars, teamwork	
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours

17.	Method of assessment		
	17.1.	Tests	50 points
	17.2.	Seminar paper/project (presentation: written and oral)	40 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction	English , Macedonian	
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures	

22.	Literature					
	22.1.	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Christiane Paul	Digital Art	Thames & Hudson	2015
		2.	Christiane Paul	A Companion to Digital Art	John Wiley & Sons	2016
		3.	Richard Lewis and James Luciana	Digital Media: An Introduction	Prentice Hall	2004
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Hugh Honour and John Fleming	The Visual Arts: A History	Pearson	2010
		2.	Peter Weibel	The post-media condition	Mute	2012
		3.	Lev Manovich	Post-Media Aesthetics	Manovich	2001

University elective No. 15	**Subject program from the first , second and third cycle of studies**

1.	Title on the teaching subject	Animation storytelling stories				
2.	Code	ICS15U05				
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences				
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences				
5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list				
6.	Academic year / semester	Third year /fifth semester	7.	Number of ECTS credits	6	
8.	Teacher	Assoc. Prof. Dr. Mersiha Ismajloska				
9.	Prerequisites for enrolling in the course					
10.	Objectives of the subject program (competencies): Students will be introduced to the concept of Storytelling and the concept of storytelling for animation (animated storytelling). Students will gain knowledge that contemporary storytelling methods are not limited to one medium. This course explores how different media can be used as part of a story, making both the medium and the story stronger by emphasizing the whole. The course will examine both the traditional "linear" approach and non-traditional approaches to animation development. Principles and issues that will be presented are relevant to animation, film, and video. The application of these principles will be particularly emphasized. The primary objectives of this course are to increase students' understanding and their creative writing skills. Secondary objectives include improving visual and rhetorical presentation skills and increasing the potential to work on an animation project.					
11.	Course content: Linear style: introduction, sequence, temporal sequence, direct sequence. Principles of animation. Presentation and analysis of corpus-animated films. Functions of narrative: "boring parts", important events; psychology, emotion, mood; setting, participants; organization, audience guidance/false guidance. Critical analysis. Principles of critical storytelling. Classical and non-classical storytelling schemes. Structure, conflict (personal, social, basic), object of desire. Time-space framework. Digital storytelling. Character development, heroes and villains. Victorian rhyme. Traditional opposite non-traditional approaches towards the narration stories .					
12.	Learning methods: Lectures, exercises and workshops. Work both individually and in teams to develop original stories. Define and refine concepts. Work on ways to best tell the story and develop a script for animation.					
13.	Total available fund on time	300h				
14.	Distribution on the available time	45+30+225=300				
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching	45h		
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours		
16.	Others forms on activities	16.1.	Project tasks	100h		
		16.2.	Independent tasks	65h		
		16.3.	Homemade learning	60h		
17.	Way on assessment					
	17.1.	Tests	2x40=80 points			
	17.2.	Seminar paper/project (presentation: written and oral)	10 points			
	17.3.	Activity and participation	10 points			
18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)			
		from 51 to 60 points	6 (six) (E)			

		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Successfully completed essays and seminars; At least five points from activity and participation	
20.	Language of instruction	English , Macedonian	
21.	Method of monitoring the quality of teaching	Self-evaluation and external evaluation	

22. Literature

22.1. Mandatory literature

Serial number	A second	Title	Publisher	Year
1	Mieke Ball	Narratology: Introduction to the Theory of Narrative	University of Toronto Press	2009
2	Lubbock Percy	The Craft of Fiction, Create Space	Independent Publishing Platform	2011
3	Lutz Edvin George	Animated Cartoons	Boston, Applewood	1989
4	Scott McCloud	Understanding Comics: The Invisible Art	William Morrow Paperbacks	1994

22.2. Additional literature

Serial number	A second	Title	Publisher	Year
1	Richard, L. Lewis. James, Luciana	Digital Media: An Introduction	Prentice Hall	2004
2	Richard, Schickel	The Disney Version: The Life, Times, Art and Commerce of Walt Disney	Ivan R. Dee 3rd edition	1997
3	Aristotle	Poetics	Penguin Classics	1997

University elective No. 16		**First cycle study program**
1.	Title on the teaching subject	Intertextuality and hypertextuality in game theory
2.	Code	ICS15U06
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences

5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list			
6.	Academic year / semester	Third year /fifth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Mersiha Ismajloska			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): To understand and apply the terms intertextuality and hypertextuality . Introduction to game theory and strategic thinking. Literary models for game design and analysis are presented, as well as various modern computer games. Students are introduced to the history of video games, narratives and interactivity in games, uncertainty and the virtual economy in games.				
11.	Course content: games . Literary approach to games . Games as a system of culture . Interactivity in games. Defining games. Defining digital games. Defining rules. Rules for games . Games as a system of uncertainty. Defining on Culture . Recognizing literary codes in games.				
12.	Learning methods: Oral presentation method, lecture method, independent work method and technical aid method				
13.	Total available fund on time	180 hours			
14.	Distribution on the available time	45+30+105=180			
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45h	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Others forms on activities	16.1.	Project tasks	100h	
		16.2.	Independent tasks	65h	
		16.3.	Homemade learning - tasks	60h	
17.	Way on assessment				
	17.1.	Tests		2x40=80 points	
	17.2.	Individual work/project (presentation: written and oral)		10 points	
	17.3.	Activity and participation		10 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			51 x to 60 points	6 (six) (E)	
			61 x to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	

			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Requirement for signature and passing the final exam				
20.	Language of instruction		English , Macedonian		
21.	Method of monitoring the quality of teaching				
22.	Literature				
	22.1.	Mandatory literature			
		Serial number	A second	Title	Publisher	Year
		1.	Katie Salen Tekinbas and Eric Zimmerman	Rules of Play: Game Design Fundamentals (The MIT Press)	The MIT Press	2003
		2.	Richard Rouse III	Game Design: Theory and Practice (2nd Edition) (Wordware Game Developer's Library)	Jones & Bartlett Learning; 2nd edition	2004
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Prajit K. Dutta	Strategies and Games: Theory and Practice	The MIT Press; Illustrated edition	1999
		2.	Martin J. Osborne	An Introduction to Game Theory	Oxford University Press; 1st edition	2003
		3.				

University elective No. 17		**First cycle study program**
1.	Title on the teaching subject	Public speaking
2.	Code	MIR15U06
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences

5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list			
6.	Academic year / semester	Third year / fifth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Dr. Goran Šibakovski			
9.	Prerequisites for enrolling in the course	There is none.			
10.	Course objectives (competencies): This course is an introduction to public speaking and emphasizes it as a practical skill, including techniques for overcoming public speaking anxiety and the use of visual aids to enhance a speaker's presentation. Students will acquire public speaking skills and learn how to overcome public speaking anxiety. The course also aims to prepare students for success in typical public speaking situations and to provide them with the basic principles of speech organization and audience research that are necessary for effective public speaking.				
11.	Content of the subject program: 1. Introduction to the subject. 2. Public speaking as communication. Purpose of public speaking. Being a public speaker. 3. Public speaking. Dealing with the fear of public speaking (stage fright). Tips and techniques for mastering public speaking. 4. Nonverbal communication or body language. 5. Types and types of public speaking. First part. 6. Types and types of public speaking. Second part. 7. Choosing a topic and purpose. Analysis and research of the audience. 8. Preparing a speech. Introduction. Organization and development of speech. Conclusion. 9. Support and accompanying material for public speaking. Using the Internet. Using visual aids, preparing a presentation and presentation software. 10. Tips for public speaking from great speakers. Case studies. Examples from films. 11. Public speaking in practice. Analysis of public speech. 12. Language and style in public speaking. 13. Information and communication technologies and public speaking today.				
12.	Learning methods: Lectures and theoretical teaching, exercises, independent seminar work, teamwork in groups, project and independent assignments, homework, consultations.				
13.	Total available fund on time	6 EXT x 30 hours/credit = 180 hours			
14.	Distribution on the available time	45+30+35+35+35 = 180 hours			
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Others forms on activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homemade learning - tasks	35 hours	
17.	Way on assessment				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		10 points	
	17.3.	Activity and participation		10 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	

		51 x to 60 points	6 (six) (E)
		61 x to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Regular attendance at classes in accordance with UINT regulations	
20.	Language of instruction	English , Macedonian	
21.	Method of monitoring the quality of teaching	Self-evaluation and mechanisms for monitoring the quality of teaching at UINT	

22.	Literature					
	22.1.	Mandatory literature				
		Serial number	A second	Title	Publisher	Year
		1.	German, Kathleen M. and Bruce E Gronbeck , Douglas Ehninger , Alan H. Monroe	Principles of Public Speaking	Routledge	2016
		2.				
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Carnegie, Dale	The Art of Public Speaking	Samaira Book Publishers	2019
		2.				
		3.				

University elective No. 18		**First cycle study program**
1.	Title on the teaching subject	Elections, electoral systems and technology
2.	Code	MIR15U07
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences
5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list

6.	Academic year / semester	Third year / fifth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Dr. Goran Šibakovski			
9.	Prerequisites for enrolling in the course	There is none.			
10.	Course objectives (competencies): Students will become familiar with the basics, potential and challenges of elections, electoral systems and technology in countries around the world. Special emphasis is placed on an overview of the past, present and future of elections, electoral systems and technology, as well as research into the intersections of new technologies with electoral systems, the human factor, political processes, etc. Students will be able to distinguish between basic electoral systems and electoral technologies, as well as be able to develop a concept for the application of electoral technologies and the organization of remote elections.				
11.	Course content: 1. Introduction to the subject. 2. Basics of elections, electoral systems and electoral technologies. Similarities and differences. 3. Electoral systems and remote voting around the world. 4. Historical development and legal and political aspects of elections and electoral technologies. The experience of Switzerland, Norway and Estonia. 5. Elections and remote voting in Europe. The Estonian eco-system as a model. 6. Diffusion of remote voting and elections. The Estonian experience 2005 – 2015. 7. Mobilization. Remote voting and the costs of participating in elections. "Stickiness" of remote voting. 8. Verification and trust. Political neutrality of remote voting and elections. 9. ICT certification in remote election conditions. 10. New technology, the human factor and remote elections. 11. Comparative aspects of remote elections in developed and developing countries. 12. The topic of remote elections in the Republic of Macedonia. Opportunities and challenges. 13. Potential and challenges of remote elections and voting around the world.				
12.	Learning methods: Lectures and theoretical teaching, exercises, independent seminar work, teamwork in groups, project and independent assignments, homework, consultations.				
13.	Total available fund on time	6 EXT x 30 hours/credit = 180 hours			
14.	Distribution on the available time	45+30+35+35+35 = 180 hours			
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Others forms on activities	16.1.	Project tasks	35 hours	
		16.2.	Independent tasks	35 hours	
		16.3.	Homemade learning - tasks	35 hours	
17.	Way on assessment				
	17.1.	Tests		80 points	
	17.2.	Individual work/project (presentation: written and oral)		10 points	
	17.3.	Activity and participation		10 points	
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)	
			51 x to 60 points	6 (six) (E)	
			61 x to 70 points	7 (seven) (D)	

		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Regular attendance at classes in accordance with UINT regulations	
20.	Language of instruction	English , Macedonian	
21.	Method of monitoring the quality of teaching	Self-evaluation and mechanisms for monitoring the quality of teaching at UINT	

22.	Literature					
	22.1.	Mandatory literature				
		Serial number	A second	Title	Publisher	Year
		1.	Hao , Feng, Peter YA Ryan	Real-World Electronic Voting: Design, Analysis and Development	CRC Press, Taylor & Francis Group	2017
		2.				
		3.				
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Solvak , Mikhel & Kristijan Vassil	E-voting in Estonia: Technological Diffusion and Other Developments Over Ten Years (2005-2015)	University of Tartu	2016
		2.				
		3.				

University elective No. 19		**First cycle study program**			
1.	Title of the course	Negotiation and dispute resolution			
2.	Code	MIR16U09			
3.	Study program / Faculty	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year / semester	3rd year / 5th semester	7.	Number of ECTS credits	6
8.	Teacher	Dr. Ivan Bimbilovski			

9.	Prerequisites for enrolling in the course	Passed state graduation		
10.	Objectives of the subject program (competencies): At the end of the semester, students will be able to: • To understand the main theories, models and concepts on which negotiation and dispute resolution are based, i.e. to understand how negotiation and dispute resolution take place; • To recognize different approaches to negotiation and dispute resolution and to adapt to them; • To develop skills for effective and persuasive negotiation and dispute resolution and to apply them in various situations in everyday life and business.			
11.	Course content: The course program covers topics and problems such as: negotiation (strategy and tactics for negotiation; negotiation through a mediator or proxy; negotiation between teams or multiple parties; emotions in negotiation; cultural differences in negotiation; why negotiations sometimes fail); mediation (goals of the mediator; what a mediation session looks like and takes place; mediation skills in questioning; mediation techniques); fairness and quality of mediation (encouragement of the use of mediation by the state; advantages and disadvantages of mediation from the perspective of social sciences; regulation of mediation; professional responsibility of the mediator); confidentiality of mediation (right to refuse to share information acquired during mediation in court proceedings; obligation to maintain confidentiality; limitation of confidentiality due to public interest or rights of public access); arbitration (procedure and legal issues in arbitration; arbitration of claims based on legal rights; arbitration ethics), etc.			
12.	Learning methods: This course is based on 45 hours of lectures, supplemented by 30 hours of exercises.			
13.	Total available fund on time	6 ECTS credits x 30 hours/credit = 180 hours		
14.	Allocation of available time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total time of 180 hours		
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours
17.	Grading method 80 + 15 + 5			
	17.1.	Tests		80 points
	17.2.	Seminar paper/project (presentation: written and oral)		15 points
	17.3.	Activity and participation		5 points
18.	Assessment criteria (points/grade)	up to 50 points		5 (five) (F)
		from 51 to 60 points		6 (six) (E)
		from 61 to 70 points		7 (seven) (D)
		from 71 to 80 points		8 (eight) (C)
		from 81 to 90 points		9 (nine) (B)
		from 91 to 100 points		10 (ten) (A)
19.	Requirement for signature and passing the final exam	Students should ensure regular attendance at classes in accordance with the UINT regulations.		
20.	Language of instruction	English , Macedonian		
21.	Method of monitoring the quality of teaching	Monitoring UINT control procedures		
	Literature			

	22.1	Required literature				
		Serial number	A second	Title	Publisher	Year
		1.	Stephen B. Goldberg, Frank EA Sander, Nancy H. Rogers, Sarah Rudolph Cole	Dispute Resolution: Negotiation, Mediation, Arbitration, and Other Processes, 7th Edition	Aspen Publishing	2020
	22.2	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Russell Korobkin	Negotiation: Theory and Strategy, 3rd Edition	Aspen Publishing	2014

University elective No. 20	**Subject program from the first , second and third cycle of studies**				
1.	Title of the course	Visual Arts and 3D Character Animation			
2.	Code	CNS16U06			
3.	Study program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle			
6.	Academic year/semester	3rd year /6th semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Jane Bakreski			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): Using the so-called " box " modeling, the content of the course program includes character modeling with appropriate topology, as well as character preparation for animation: creating a motion system, animating a character, rendering, etc. Additional techniques will be studied to add realistic details and visuals. character and environment effects. The focus of the course program is building strong 3D environments and 3D characters and their animation, as a key part of the modern film, gaming, advertising industries, but also of modern science, medicine, architecture, etc.				
11.	Course content: • Pre-production o Production planning o Idea and story development o Script writing o Character and environment design o Storyboard o Animatic and previsualization • Production o Character and environment modeling and texturing o Creation on system for movement o Character animation o Setting up, lighting and rendering a scene • Post-production: o Installation o Visual Effects (VFX) o Correction on color				

	○ Packaging of the final product and distribution			
12.	Learning methods:			
13.	Total available fund on time		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Allocation of available time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework work: 105 hours = Total time of 180 hours	
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Other forms of activities	16.1.	Project tasks	35 hours
		16.2.	Independent tasks	35 hours
		16.3.	Home learning	35 hours
17.	Method of assessment			
	17.1.	Tests		50 points
	17.2.	Seminar paper/project (presentation: written and oral)		40 points
	17.3.	Activity and participation		10 points
18.	Assessment criteria (points/grade)		up to 50 points	5 (five) (F)
			from 51 to 60 points	6 (six) (E)
			from 61 to 70 points	7 (seven) (D)
			from 71 to 80 points	8 (eight) (C)
			from 81 to 90 points	9 (nine) (B)
			from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		Students should ensure regular attendance at classes in accordance with the UINT regulations.	
20.	Language of instruction		English , Macedonian	
21.	Method of monitoring the quality of teaching		Monitoring UINT control procedures	

22.	Literature					
		Required literature				
		Serial number	A second	Title	Publisher	Year
	22.1.	1.	Ami Chopin	3D Art Essentials: The Fundamentals of 3D Modeling, Texturing, and Animation	Focal Press	2011
		2.	Andy Beane	3D Animation Essentials	John Wiley & Sons	2012
		3.	William Vaughan	Digital Modeling	Pearson	2012
		Additional literature				
		Serial number	A second	Title	Publisher	Year
	22.2.	1.	Ollie Johnston and Frank Thomas	The Illusion of Life: Disney Animation	Disney Editions	1995

University elective No. 21		**First cycle study program**			
1.	Title on the teaching subject	Art and creativity			
2.	Code	ICS16U07			
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list			
6.	Academic year / semester	Third year /sixth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Mersiha Ismajloska			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): Gaining knowledge about the general elements and concepts of art history and becoming familiar with the development of artistic disciplines throughout history. Throughout time, art has been classified in various ways, from the medieval distinction between liberal arts and mechanical arts, to the modern distinction between fine and applied arts, or the many contemporary definitions that define art as a manifestation of human creativity.				
11.	Course content: Concept, tasks and methods of art history. Artistic disciplines and artistic techniques. Chronological overview of artistic production throughout prehistoric and historical eras – the art of prehistory, the creations of the protohistoric period, the art of ancient civilizations, the creations of antiquity and the Middle Ages, the Renaissance and Baroque eras, contemporary and modern artistic production – and secondly , works and aesthetic achievements.				
12.	Learning methods: Lectures, exercises, visits to exhibitions and objects significant for the History of Art				
13.	Total available fund on time	300h			
14.	Distribution on the available time	45+30+225=300			
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching .	45h	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours	
16.	Others forms on activities	16.1.	Project tasks	100h	
		16.2.	Independent tasks	65h	
		16.3.	Homemade learning - tasks	60h	
17.	Way on assessment				

	17.1.	Tests	2x40=80 points
	17.2.	Individual work/project (presentation: written and oral)	10 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		51 x to 60 points	6 (six) (E)
		61 x to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam		
20.	Language of instruction	Anagliski	
21.	Method of monitoring the quality of teaching		

22. Literature

22.1. Mandatory literature

Serial number	A second	Title	Publisher	Year
1.	Hugh Honour & John Fleming	The Visual Arts: A History (revised 7th edition)	Pearson	2010
2.	Giorgio Vasari, Julia Conway Bondanella , Peter Bondanella	The Lives of the Artists (Oxford World's Classics	Oxford University Press; Reissue edition	2008
3.				

22.2. Additional literature

Serial number	A second	Title	Publisher	Year
1.	Easter Kuzman ; Julia Tričkovska ; Zoran Pavlov; Elizabeth Bakovska	Ohrid world heritage site	Skopje: Ministry of Culture of the Republic of Macedonia, Cultural Heritage Protection Office	2009
2.				
3.				

University elective No. 22	**Subject program from the first , second and third cycle of studies**				
1.	Title on the teaching subject	Creative writing			
2.	Code	ICS16U08			
3.	Studio program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Organizer of the study program (unit, i.e. institute, department, division)	University of Information Sciences and Technologies "St. Paul the Apostle" - Ohrid; Faculty of Information and Communication Sciences			
5.	Degree (first, second, third cycle)	First cycle – elective subject from the university list			
6.	Academic year / semester	Third year /sixth semester	7.	Number of ECTS credits	6
8.	Teacher	Assoc. Prof. Dr. Mersiha Ismajloska			
9.	Prerequisites for enrolling in the course				
10.	Objectives of the subject program (competencies): An overview of basic theories of story structure, followed by a structured series of exercises that allow students to develop basic story frameworks. Lessons focus on dramatic action, conflict, character/characterization, and dialogue. The course will stimulate students' creative abilities. Students will be introduced to creative writing techniques. The course will also serve as an introduction to writing original poetry, short fiction, and drama. In addition to the course, students will read a corpus of selected literary literature, which will introduce them to literary conventions and practices. Students will learn to critically approach their own works and the works of others . Students will also be introduced to the possibilities of publishing their works and their realization in computer games or animations. 1. Students will be introduced to the concepts of literature, especially the elements of poetry, prose, and drama. 2. Students will use literary concepts to analyze texts of selected a second and. 3. Students will use literary concepts to write their own original manuscripts. By the end of the semester, students will have their own portfolio of texts. 4. Students will use concepts of literature to critically evaluate the quality of their own manuscripts and the manuscripts of others. 5. Students will learn to evaluate texts according to criteria acquired in creative writing workshops.				
11.	Course content: What is creative writing as an academic discipline? Creative writing in the development of computer games and animations. Where is the place of our own stories and poems, and our writing goals? What is the value of creative writing personally, socially, and politically? The difference between fiction and non-fiction. 1. Study Program / Portfolios 2. Memoirs / Short story 3. Short Story Analysis / Summaries 4. Short Story Writers / Workshop 5. Introduction to writing poetry 6. Introduction to Writing Fiction 7. Introduction to Dramatic Writing 8. "Reading" games - methods and practice of analyzing the formal components of games 9. Approaches to Game and Player Analysis / Workshop 10. Dramaturgy/Screenwriting 11. Socio-cultural contexts - Analysis of social and cultural influences on games and animations 12. Critical/Creative Writing 13. Creative Writing and Creative Industries 14. Working on a text for a computer game or animation 15. Final portfolio				
12.	Learning methods: Short exercises and a combination of tasks to motivate students. Comparative-contrast method. Creative writing exercises that will use the adopted concepts of narrative such as time, space, character, ending. Lectures , workshops , guests lecturers .				

13.	Total available fund on time		300h	
14.	Distribution on the available time		45+30+225=300	
15.	Forms on the teaching activities	15.1.	Lectures - theoretical teaching	45h
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 hours
16.	Others forms on activities	16.1.	Project tasks	100h
		16.2.	Independent tasks	65h
		16.3.	Homemade learning	60h

17.	Way on assessment		
	17.1.	Tests	2x40=80 points
	17.2.	Seminar paper/project (presentation: written and oral)	10 points
	17.3.	Activity and participation	10 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		from 51 to 60 points	6 (six) (E)
		from 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (C)
		from 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	Requirement for signature and passing the final exam	Successfully completed essays and seminars; At least five points from activity and participation	
20.	Language of instruction	English , Macedonian	
21.	Method of monitoring the quality of teaching	Self-evaluation and external evaluation	

22. Literature

Mandatory literature

Serial number	A second	Title	Publisher	Year
1.	Barthes, Roland	Introduction to the Structural Analysis of Narrative	Trans. Lionel Duisit . New Literary History: A Journal of Theory and	1978

22.1.

					Interpretation	
		2.	Despain , Wends	Writing for Video Game Genres: From FPS to RPG	AK Peters/CRC Press.	2009
		3.	Despain , Wendy	Professional Techniques for Video Game Writing	AK Peters/CRC Press	2008
		4.	Ince , Steve	Writing for Video Games	Methuen Drama	2006
	22.2.	Additional literature				
		Serial number	A second	Title	Publisher	Year
		1.	Ball, Mieke	Narratology: Introduction to the Theory of Narrative	University of Toronto Press.	1985
		2.	McCloud, Scott	Understanding Comics: The Invisible Art.	William Morrow.	1994
		3.	Aristotle	Poetics	Penguin Classics	1997

University Elective No. 24	**Course Program – first, second and third Cycle Studies**				
1.	Course Title	Video Art and Production			
2.	Code	CNS16U08			
3.	Study Program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology "St. Paul the Apostle" – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle			
6.	Academic Year / Semester	4th year / 8th semester	7.	Number of ECTS Credits	6
8.	Instructor	Assoc. Prof. Dr. Jane Bakreski			
9.	Prerequisites for Enrollment				
10.	Course Objectives (Competencies): The aim of this course is to familiarize students with the basic concepts and creative processes of professional video and audio production. Using various equipment, students will learn the important aspects of video production – from idea development, concept and story, through working with a digital video camera, recording video and audio, etc., to video editing and packaging the final product. Upon completing this course, students will have the knowledge and skills to successfully record video and audio and edit these two elements to tell a story.				
11.	Course Content: • Pre-production o Production planning o Idea and story development o Screenplay writing • Production o History of the camera o Technical characteristics of the camera o Recording concepts and processes o Composition o Mise-en-Scene • Post-production: o Editing o Image and sound processing				

	○ Distribution			
12.	Teaching Methods:			
13.	Total Available Time		6 ECTS credits x 30 hours/credit = 180 hours	
14.	Distribution of Available Time		Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total 180 hours	
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction	45 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork	30 часови
Other Forms of Activities	Други форми на активности	Other Forms of Activities	Project Tasks	35 hours
		16.2.	Independent Tasks	35 hours
		16.3.	Home Study	35 hours
17.	Assessment Method			
	17.1.	Tests		50 points
	17.2.	Seminar paper / Project (presentation: written and oral)		40 points
	17.3.	Activity and Participation		10 points
18.	Kriteria for Grading (points / grade)		up to 50 points	5 (five) (F)
			51 to 60 points	6 (six) (E)
			61 to 70 points	7 (seven) (D)
			71 to 80 points	8 (eight) (C)
			81 to 90 points	9 (nine) (B)
			91 to 100 points	10 (ten) (A)
19.	Condition for Signature and Final Exam		Students must ensure regular class attendance in accordance with UIST regulations	
20.	Language of Instruction		English, Macedonian	
21.	Teaching Quality Monitoring Method		Adherence to UIST quality control procedures	

22.	Literature					
	22.1.	Required Literature				
		No.	Author	Title	Publisher	Year
		1.	David Bordwell and Kristin Thompson	Film Art: An Introduction	McGraw-Hill Education	2012
		2.	Jim Owens and Gerald Millerson	Video Production Handbook	Focal Press	2011
		3.	Prof. Dr. Antonio Mitrikeski	Film as Art	University “Ss. Cyril and Methodius”, Skopje	2021
	22.2.	Additional Literature				
		No.	Author	Title	Publisher	Year
		1.	Barbara London, Jim Stone and John Upton	Photography	Pearson	2016
		2.				

University Elective No. 25		**Course Program – first First Cycle Studies**			
1.	Course Title	English for Specific Purposes (ESP)			
2.	Code	ISVMA16U07			
3.	Study Program	Digital Business Analytics / Faculty of Information and Communication Sciences			
4.	Study Program Organizer (unit / institute / department)	University of Information Science and Technology "St. Paul the Apostle" – Ohrid; Faculty of Information and Communication Sciences			
5.	Level (first, second, third cycle)	First cycle – university elective course			
6.	Academic Year / Semester	Second year / Fourth semester	7.	Number of ECTS Credits	6
8.	Instructor	Lina Milosheska			
9.	Prerequisites for Enrollment				
10.	Course Objectives (Competencies): English for Specific Purposes ESP is an approach to English language learning oriented toward specific purposes (scientific, technological, economic, and academic fields). ESP is designed to meet the needs of students who, in addition to general English, require practice in particular professional areas. Upon completing the course, the student will have improved general grammar, an expanded vocabulary (both general and in the chosen area of expertise), the ability to communicate orally and in writing, and enhanced reading comprehension in the chosen field of expertise.				
11.	Course Content: ● Component 1. Language Structure Knowledge and skills acquired: - Mastery of basic English grammar rules and structures; - knowledge of word-formation mechanisms and vocabulary, including easily confused "false friends" - ability to apply grammar rules in free and controlled written and oral expression. ● Component 2. Professional Communication Knowledge and skills acquired: - mastery of specific terminology and stylistic norms in the chosen area of expertise - developing the ability to read, understand, and discuss texts in the chosen field of expertise - ability to distinguish different genres and forms of written professional and academic texts and process them. - mastery of presentation skills - ability to deliver speeches and participate in discussions in the chosen field of expertise, in good English - familiarization with the most common challenges students face in a specific field from a linguistic perspective as a medium in international contexts - Gaining greater confidence regarding verbal, written, and communication skills				
12.	Teaching Methods: This course is based on 45 hours of lectures supplemented by 30 hours of exercises				
13.	Total Available Time	6 ECTS credits x 30 hours/credit = 180 hours			
14.	Distribution of Available Time	Lectures: 45 hours; Exercises: 30 hours; Independent preparation, projects, homework: 105 hours = Total 180 hours			
15.	Forms of Teaching Activities	15.1.	Lectures – theoretical instruction.		45 hours

		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	30 hours
16.	Other Forms of Activities	16.1.	Project Tasks	35 hours
		16.2.	Independent Tasks	35 hours
		16.3.	Home Study – Assignments	35 hours

17.	Assessment Method 80 + 15 + 5		
	17.1.	Tests	80 points
	17.2.	Individual work / Project (presentation: written and oral)	15 points
	17.3.	Activity and Participation	5 points

18.	Kriteria for Grading (points / grade)	up to 50 points	5 (five) (F)
		51 to 60 points	6 (six) (E)
		61 to 70 points	7 (seven) (D)
		71 to 80 points	8 (eight) (C)
		81 to 90 points	9 (nine) (B)
		91 to 100 points	10 (ten) (A)
19.	Condition for Signature and Final Exam	Students must ensure regular class attendance in accordance with UIST regulations	
20.	Language of Instruction	English	
21.	Teaching Quality Monitoring Method	Adherence to UIST quality control procedures	

22. Literature

22.1. Required Literature

No.	Author	Title	Publisher	Year
1.	Laurence Anthony	Introducing English for Specific Purposes	Routledge	2018
2.	Sunny Hyon	Introducing Genre and English for Specific Purposes	Routledge	2017

22.2. Additional Literature

No.	Author	Title	Publisher	Year
1.	James Dean Brown	Introducing Needs Analysis and English for Specific Purposes	Routledge	2016