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

Serial number: 1

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Methodology of Scientific Research Work**			
2.	Code	23ISE21A010			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / first semester	7.	Number of ECTS credits	6
8.	A teacher	Associate prof. dr. Shpetim Rexhepi			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** The aim of this course is to provide students with knowledge and understanding of various scientific theories and methodologies applied in the field of software engineering. After completing the course, students will be able to: thoroughly explain and understand the meaning of basic scientific concepts, effectively search for relevant information and literature, identify, formulate and describe scientific problems, make a careful choice of alternative research approaches, thoroughly describe, compare and explain the advantages and disadvantages of different scientific methods for collecting quantitative and qualitative data, apply basic scientific methods for analyzing quantitative and qualitative data, understand different frameworks for theory building as well as evaluate and review scientific publications.				
11.	**Course Content:** The main goal of this course is to provide students with the basic concepts of scientific research through the use of various methods such as researching epistemological and methodological approaches in the field of technology, finding scientific literature, structuring and writing scientific papers in accordance with international standards. for scientific publishing as well as presentation and discussion of relevant scientific issues in the field of media technology.				
12.	Learning methods: The course will be studied through advanced forms of lectures and exercises, discussions. It will be realized with audiovisual techniques, demonstrations, immediate solving of tasks, critical and creative approach, work and discussions in groups, solving homework, etc.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .		2 x 15 = 30 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.		1 x 15 = 15 hours
16.	Other forms of activities	16.1.	Project tasks		45 hours
		16.2.	Independent tasks		30 hours
		16.3.	Home study - assignments		60 hours
17.	Method of assessment				
	17.1.	Tests		70 points	

	17.2.	Individual work/project (presentation: written and oral)		20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises	
20.	Language of instruction		Albanian, Macedonian and English language	
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students	

22.

Literature					
22.1.	Required reading				
	Ord. number	Author	Title	Publisher	Year
	1.	Lazar, J., Feng, J. H., and Hochheiser H.	Research Methods in Human Computer Interaction	John Wiley & Sons Ltd	2010
	2.				
	3.				
22.2.	Additional literature				
	Ord. number	Author	Title	Publisher	Year
	1.	Wilhelm Hasselbring / Simon Giesecke (Hrsg.)	Research Methods in Software Engineering	Trustworthy Software Systems	2006
	2.				
	3.				

Serial number: 2

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Applied Software Engineering**			
2.	Code	23ISE21A020			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / first semester	7.	Number of ECTS credits	6
8.	A teacher	Prof. dr. Bekim Fetaji			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Acquisition of theoretical knowledge of applied software engineering and software processes. Understanding of the basic models of software processes and the ability to use them practically on specific projects. Training for monitoring and participating in the activities during the development of software requirements and specification, development, testing and evolution of software. Familiarity with SASE technologies and tools used as support in software processes. Gaining practical experience of working with various software tools.				
11.	**Course Content:** Analysis of applied software engineering and software processes. A model of comparing software projects. Software process models: error and fix model, waterfall model, evolutionary development model. Software process models: incremental development model, off-the-shelf component usage model, spiral model, extreme programming model. Fundamentals of Requirements Engineering. Basics of creating system specifications. Modeling of systems. Basics of the UML language. Design of software systems. Methods and techniques of software implementation. Software Verification. Software validation. Expertise and safety. Conditional engineering. Safety Engineering. Project management. Project planning. Quality management.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises		
20.	Language of instruction		Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		
22.	Literature				
	22.1.	Required reading			
		Ord. number	Author	Title	Publisher	Year
		1.	Ian Sommerville	Software Engineering, 10th Ed.	Addison Wesley	2015
		2.	S.R. Schach	Object Oriented & Classical Software Engineering, 7-th Ed.	McGraw Hill	2006
		3.				
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.	R. S. Pressman	Software Engineering: A Practiontionner Approach	McGraw-Hill	2008
		2.				
		3.				

Serial number: 3

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Advanced Algorithms and Data Structures**			
2.	Code	23ISE21A030			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / first semester	7.	Number of ECTS credits	6
8.	A teacher	Prof. dr. Aleksandar Dimovski			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** This course builds on previous knowledge of algorithms and data structures. The aim of this course is to introduce students to advanced efficient algorithms and appropriate data structures used for organization, query and optimization of data. Theoretical efficiency of algorithms and its practical determination are also considered in order to be able to compare different algorithms. During the course, students will be introduced to several well-known algorithms, especially for search and optimization in complex nonlinear structures, such as trees and graphs.				
11.	**Course Content:** The program includes the following topics: analysis of recursive algorithms and random techniques, sorting algorithms and complexity comparison (counting, radix, heapsort, quicksort, linear sorting), methods of algorithm conception (divide and rule, dynamic programming, greedy algorithms) , data structures (heap, sets and balanced trees), augmenting existing structures, hash methods and functions, graphs and algorithms for depth and breadth search, heuristic search, algorithms for finding the shortest path, optimization and linear programming, maximum flow in a network, etc.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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			Attendance 80% of the teaching Submitted individual works and Completed duties of exercises		
20.	Language of instruction			Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching			Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		
22.	Literature					
	22.1.	Required reading				
		Ord. number	Author	Title	Publisher	Year
		1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	Introduction to Algorithms, Second Edition	The MIT Press	2001
		2.				
		3.				
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.	Algorithms. by S. Dasgupta, C.H. Papadimitriou, and U.V. Vazirani	Algorithms	McGraw-Hill	2006
		2.				
		3.				

Serial number: 4

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Discrete Mathematics and its Application in Programming**			
2.	Code	23ISE21A040			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / first semester	7.	Number of ECTS credits	6
8.	A teacher	Assistant prof. dr. Egzona Iseni Rexhepi			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Students get to know the methods of discrete mathematics and structures, solve problems and apply them in solving different problems in programming.				
11.	**Course Content:** Finite sets. Variations, permutations, combinations. Counting subsets of a set – combinations, r-combinations with allowed repetition, Pascal's formula and Binomial theorem. Principle of inclusion and exclusion. Sequences, Mathematical Induction, and Recursion. Explicit Formulas for Sequences, Sequences in Computer Programming. Principles of mathematical induction and its application in correctness of algorithms. Defining recurrent sequences and solving them, structural induction. Latin Squares and Application. Theory of sets. Relations and properties of relations. Functions. Binary operations. Modular Arithmetic. Numerical systems. Amounts. Divisibility.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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			Attendance 80% of the teaching Submitted individual works and Completed duties of exercises		
20.	Language of instruction			Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching			Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		
22.	Literature					
	22.1.	Required reading				
		Ord. number	Author	Title	Publisher	Year
		1.	S.Lipschucz	Theory and problems of finite mathematics	McGraw-Hill	1996
		2.	Kenneth H. Rosen	Discrete Mathematics and its applications, 6th edition.	The Mc Graw-Hill Companies	2007
		3.	Susanna S. Epp	Discrete Mathematics with application, 4th edition	Brooks/Cole Cengage Learning	2011
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.	Rowan Garnier, John Taylor	Discrete Mathematics for New Technology Second Edition	Op Publishing Ltd	2002
		2.				
		3.				

Serial number: 5

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Object Oriented Design**			
2.	Code	23ISE21B050			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / first semester	7.	Number of ECTS credits	6
8.	A teacher	Associate prof. dr. Mirlinda Ebibi			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Getting to know the techniques for analysis, design and modeling of object-oriented systems. Training for practical analysis of user requirements and creation of effective OO models as the initial phase of the implementation of the OO system.				
11.	**Course Content:** An introduction to the object-oriented model of the real world, and its application in software engineering. Code reuse, standardization. Basic properties of the object-oriented paradigm. Classes and objects and notation. OO software development. Modularity, hierarchy, aggregation and generalization. Basic concepts of UML. Basic class diagrams. Associations between classes. Limitations and Qualifiers. Interfaces. User scenario diagrams. Inclusion and extension functions. Activity diagrams. State diagrams. Sequence diagrams. Collaboration diagrams. Interaction with other systems. Defining interfaces to other systems using UML. Component diagrams. Development diagrams for implementation in UML. Real world models. Using the UML notation.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises		
20.	Language of instruction		Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		
22.	Literature				
	22.1.	Required reading			
		Ord. number	Author	Title	Publisher	Year
		1.	G. Booch, J. Rumbaugh, I. Jacobson	The Unified Modeling Language User Guide (2nd Edition)	Addison Wesley Professional	2005
		2.	Binder, R.V.	Testing object - oriented systems: Models, Patterns and Tools	The Mc Graw-Hill Companies	2007
		3.	Susanna S. Epp	Systems Analysis and Design with UML	Wiley	2007
	22.2.	Additional literature			
		Ord. number	Author	Title	Publisher	Year
		1.	M. Fowler	UML Distilled: A Brief Guide to the Standard Object Modeling	Addison-Wesley	2003
		2.				
		3.				

Serial number: 7

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Multimedia Technologies**			
2.	Code	23ISE21B060			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / first semester	7.	Number of ECTS credits	6
8.	A teacher	Prof. dr. Andrej Cvetkovski			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Students to acquire theoretical and practical knowledge of how to create, reproduce, digitize, process, transmit and deliver different types of multimedia products and applications, as well as practical knowledge of multimedia processing programs.				
11.	**Course Content:** Introduction to Multimedia. Elements of multimedia, image, video, sound, movement, text and typography, interactivity. Projecting multimedia. Challenges in multimedia content acquisition, processing and transmission systems. Images: digitization, sampling, quantization. Colors, color patterns in images and video. Raster and vector graphics, image compression algorithms, formats. Basic concepts of video, compression and coding algorithms, video standards, formats and delivery. Animation. Fundamentals of audio signals, digitization, processing, speech and music compression algorithms, delivery. Production and synthesis of sound and music. MIDI interface. Multimedia architecture of the Internet. Search and filter multimedia data.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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	Attendance 80% of the teaching Submitted individual works and Completed duties of exercises	
20.	Language of instruction	Albanian, Macedonian and English language	
21.	A method of monitoring the quality of teaching	Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students	

22. Literature

22.1. Required reading

Ord. number	Author	Title	Publisher	Year
1.	Tay Vaughan	Multimedia: Making It Work	McGraw-Hill	2014
2.	Binder, R.V.	Testing object - oriented systems: Models, Patterns and Tools	The Mc Graw-Hill Companies	2007
3.	Susanna S. Epp	Systems Analysis and Design with UML	Wiley	2007

22.2. Additional literature

Ord. number	Author	Title	Publisher	Year
1.	Vic Costello	Multimedia Foundations: Core Concepts for Digital Design, 2nd edition	Rutledge	2016
2.				
3.				

Serial number: 7

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Advanced Databases**			
2.	Code	23ISE22A010			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / second semester	7.	Number of ECTS credits	6
8.	A teacher	Assistant prof. dr. Majlinda Axhiu			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Acquaintance of students with the advanced concepts of relational databases, necessary for the creation, management and maintenance of databases, as well as for the development of data-oriented systems. In this way, they will acquire deep theoretical and practical knowledge in the field of databases. Also, students will be familiar with the modern trends of development and expansion of traditional database management systems, in order to respond to current challenges in information theory and practice.				
11.	**Course Content:** Advanced data modeling – standards and models; Architecture of database management systems; Protection and security, database recovery. Evaluation and optimization of questionnaires, indexing, partitioning, clustering of data; Distributed databases, database clusters, replication; Transactional and analytical databases.; Object-oriented and object-databases, object-relational mapping; Web-oriented and mobile systems and databases; Practical implementation of advanced modeling techniques and tools; Administration and performance tuning of database management systems; Recovery and replication tools for the same systems; Advanced SQL; Programming in databases. Query planning and optimization, transaction processing and concurrency control, ACID rules, OLTP, large scale management, data warehousing and online analytical processing (OLAP), database theory. Special purpose databases: temporal, spatial, and multimedia databases.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises		
20.	Language of instruction		Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		
22.	Literature				
	22.1.	Required reading			
		Ord. number	Author	Title	Publisher	Year
		1.	Hoffer et al.	Modern Database Management, 13th edition	Pearson Education Limited	2018
		2.	Hector Garcia Molina, Jeffrey Ullman and Jennifer Widom	Database Systems: The Complete Book	Prentice Hall	2002
		3.				
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.	Avi Silberschatz, Henry Korth, S. Sudarshan	Database System Concepts	McGraw Hill	2010
		2.	Thomas M. Connolly and Carolyn E. Begg	Database Systems: A Practical Approach to Design, Implementation and Management	Addison Wesley (5th Edition)	2009
		3.				

Serial number: 8

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Software Testing**			
2.	Code	23ISE22A020			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / second semester	7.	Number of ECTS credits	6
8.	A teacher	Prof. dr. Aleksandar Dimovski			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Acquaintance of students with the need for software testing, the different techniques of software modeling and the use of those models for testing, as well as practical work on testing, validation and verification of software Definitions and measures of reliability and reliability. Reliability and availability modeling. Error detection and error correction codes. Reliable system design: Transient versus permanent hardware errors. Sources of errors in software, Fault tolerance techniques, Reliability in VLSI devices, air control systems, telecommunication systems, industrial control applications. Trusted transaction processing systems. Software approaches and software reliability. Software reliability models. Software Reliability Methods. Reliability in operating systems and data structures. Reliability in databases and distributed systems. Design of tests. Test Generation Methods. Automatic Test Pattern Generation (ATPG).				
11.	**Course Content:** System level tests and diagnosis. Software testing. Test specifications. Black box testing. White box testing. Random tests. Test coverage. Maintenance. Analysis of risks and hazard exposures, risk reduction strategies. Inevitability of maintenance of certain systems. Maintenance behavior patterns – hardware, software, communications. Nature of maintenance: defect removal, upgrade, improvement. Configuration management and version control in engineering systems. Tool support. Building expertise, its later reuse, problems, balances, opportunities. Software validation and verification, V&V terminology and fundamentals. V&V objectives and limitations, V&V planning and documentation, metrics and measures, process participants, Types of testing, static analysis and dynamic testing, functional and non-functional testing. Software modeling with graphs. Modeling logical expressions Partitioning of input space. Syntactic modeling. Testing object-oriented applications. Testing of web applications and web services. Contemporary trends in testing.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .		2 x 15 = 30 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.		1 x 15 = 15 hours
16.	Other forms of activities	16.1.	Project tasks		45 hours
		16.2.	Independent tasks		30 hours
		16.3.	Home study - assignments		60 hours
17.	Method of assessment				
	17.1.	Tests		70 points	

	17.2.	Individual work/project (presentation: written and oral)			20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises		
20.	Language of instruction		Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		
22.	Literature				
	22.1.	Required reading			
		Ord. number	Author	Title	Publisher	Year
		1.	M. L. Shooman	Reliability of Computer Systems and Networks: Fault Tolerance, Analysis, and Design.	John Wiley & Sons, Inc	2002
		2.	Ilene Burnstein	Practical Software Testing: A ProcessOriented Approach	Springer Professional Computing	2006
		3.				
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.	Paul Ammann and Jeff Offutt	Introduction to Software Testing (2nd edition)	Cambridge University Press	2016
		2.				
		3.				

Serial number: 9

Attachment No. 3		**Course program from the second cycle of studies**					
1.	Name of the course	**Machine Learning Algorithms**					
2.	Code	23ISE22A030					
3.	Study program	Applied Software Engineering, two years studies					
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje					
5.	Degree (first, second, third cycle)	Second cycle					
6.	Academic year / semester	First year / second semester	7.	Number of ECTS credits	6		
8.	A teacher	Assistant prof. dr. Stojan Kitanov					
9.	Prerequisites for enrolling in the course	None					
10.	**Course objectives (competencies):** The aim of the course is to familiarize students with the basics of modern techniques in the field of machine learning. After completing the course, candidates will: have in-depth knowledge of advanced machine learning technologies and methods; they will be able to understand, analyze and formulate general problems in the field of machine learning; they will be able to successfully apply machine learning algorithms in solving real problems; they will be able to conceptualize, analyze, implement and evaluate the performance of a machine learning system.						
11.	**Course Content:** An introduction to machine learning and data mining techniques. Data warehouses: partitioning and aggregation, data cubes and metadata. Pre-processing, selection and transformation. Base selection, trait selection, statistical analysis. Clustering - K-Means and EM, Sobweb. Associative rules and time sequence analysis. Finding rules, multi-level rules. Spanning trees and inductive rule derivation. ID3, C45, SART, neural networks. Predictive techniques. Post-processing. Visualization and retrieval of visual data. Scalability and parallel mining. Data mining strategies in finance. Data mining of text, multimedia data and the web. Introduction to Machine Intelligence. Univariate and Multivariate Linear Regression. Logistic regression, hypothesis representation, classification, cost functions, error evaluation, model selection and validation. Bayesian theory, naive Bayesian classifier, neural networks, support vector machines, decision trees, lazy classifiers. Ensembles. Unsupervised learning and reinforcement learning. Current Issues in Machine Intelligence.						
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.						
13.	Total available time	180 hours					
14.	Allocation of available time	2+1					
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours			
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours			
16.	Other forms of activities	16.1.	Project tasks	45 hours			
		16.2.	Independent tasks	30 hours			
		16.3.	Home study - assignments	60 hours			
17.	Method of assessment						
	17.1.	Tests		70 points			

	17.2.	Individual work/project (presentation: written and oral)			20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises		
20.	Language of instruction		Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		

22.

Literature

22.1. Required reading

Ord. number	Author	Title	Publisher	Year
1.	Peter Harrington	Machine Learning in Action	Manning Publications	2012
2.	U.M.Fayyad, G. Piatetaky-Shapiro, P. Uthurusam.	Advances in Knowledge Discovery and Data Mining	AAAI/MIT Press	1996
3.	Christopher M. Bishop	Pattern Recognition and Machine Learning	Springer	2006

22.2. Additional literature

Ord. number	Author	Title	Publisher	Year
1.	Ethem Alpaydin	Introduction to Machine Learning	MIT Press	2004
2.	Ian H. Witten, Eibe Frank, Mark A. Hall	Data Mining: Practical Machine Learning Tools and Techniques	Morgan Kaufmann	2011
3.	Pang-Ning Tan, Michael iand Steinbach Vipin 'Kumar	Introduction to Data Mining	Pearson	2006

Serial number: 10

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Human – Computer Interface**			
2.	Code	23ISE22A040			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / second semester	7.	Number of ECTS credits	6
8.	A teacher	Prof. dr. Andrej Cvetkovski			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** This course introduces students to the basics of the complex interaction between man and computer. Students are also introduced to the techniques for modeling users, problems, applications and environments (environments) as well as techniques for the evaluation and analysis of intelligent interfaces. Principles for building mediators that include limitations in both primarily affected groups: the human and the computer are considered. Students should learn that the user is one of the main elements in the creation of computer systems. In doing so, insight is given into how to develop hardware and software for different groups of users, as well as for specific application domains. Students acquire knowledge of principles for designing environment-adaptive user interfaces, intelligent agent-based user interfaces and context-sensitive interfaces, as well as intelligent solutions intended for specific types of user groups.				
11.	**Course Content:** Advanced Principles of Human Computer Interaction (HCI). Factors affecting interaction. User experience modeling. Development of efficient user agents. Interaction for different user groups. Design for users with special needs. Interaction principles for special applications. Transfer of technologies in ICH. Compatibility in the design of ICH. User modeling techniques. Environment modeling techniques. Adaptable user interfaces. Agent-based user interfaces. Multimedia user interfaces. Advanced interfaces for human-computer collaboration. buildable user interfaces. Mobile interfaces. Cognitive aspects of user interfaces. User interfaces for people with sensory and motor impairments. Testing and evaluation of user interfaces.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				

	17.1.	Tests	70 points
	17.2.	Individual work/project (presentation: written and oral)	20 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	Attendance 80% of the teaching Submitted individual works and Completed duties of exercises	
20.	Language of instruction	Albanian, Macedonian and English language	
21.	A method of monitoring the quality of teaching	Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students	

22. Literature

Required reading

Ord. number	Author	Title	Publisher	Year
1.	John M. Carroll,	HCI Models, Theories, and Frameworks	Morgan Kaufmann	2003
2.	J. Jacko & A. Sears (Eds.)	The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications (3rd ed)	CRC Press	2012
3.				

22.1.

Additional literature

Ord. number	Author	Title	Publisher	Year
1.	D. Benyon, P. Turner, and S. Turner	Designing Interactive Systems. People, Activities, Contexts, Technologies, Third Edition	Addison Wesley	2005
2.				
3.				

22.2.

Serial number: 11

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Advanced Programming of Mobile Devices**			
2.	Code	23ISE22B050			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / second semester	7.	Number of ECTS credits	6
8.	A teacher	Associate prof. dr. Mirlinda Ebibi			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** The purpose of this course is for students to get to know the basics of programming mobile devices in different platforms such as Android, iOS, Windows and others. After completing the course, the student is expected to understand and have in-depth knowledge of mobile operating systems, in-depth knowledge of programming native mobile applications, mobile web.				
11.	**Course Content:** Mobile operating systems (Android and iOS). Native apps and mobile web apps, conceptual differences and development approach. Concepts of mobile application development, with reference to the differences that mobility brings. Mobile infrastructures, difference between mobile and wireless. Characteristics of mobile applications (multimodal interaction, multiple communication channels, infrastructure limitations). User interfaces and interaction in mobile applications. Characteristics of a mobile user (inability to focus, differences originating from different cultures). User-centered methods and tools for mobile application design. Development platforms and technologies. Testing of mobile applications and their implementation. Integration of mobile applications in information systems. Mobile applications and their interoperability with web-based solutions. Multi-context mobile solutions. Ubiquitous devices and services. Mobile Sensor Technologies and Applications. Short-range communication technology. Mobile sensor systems. Integration with databases, working with memory on mobile devices, mobile animated graphics. Mobile social networks, location-based applications and games, mobile electronic banking, mobile electronic commerce, mobile learning, mobile health services.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises	
20.	Language of instruction		Albanian, Macedonian and English language	
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students	

22. Literature

22.1. Required reading

Ord. number	Author	Title	Publisher	Year
1.	Zigurd Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura	Programming Android: Java Programming for the New Generation of Mobile Devices	O'Reilly Media	2013
2.	Maximiliano Firtman	Programming the Mobile Web	O'Reilly Media	2013
3.	Tommi Mikkonen	Programming Mobile Devices: An Introduction for Practitioners	Wiley	2007

22.2. Additional literature

Ord. number	Author	Title	Publisher	Year
1.	Daniel Vaughan	Windows Phone 7.5 Unleashed	Sams	2012
2.	Adrian Kosmaczewski	Mobile JavaScript Application Development: Bringing Web Programming to Mobile Devices	O'Reilly Media	2012
3.	Carol Hamer	Creating Mobile Games: Using Java ME Platform to Put the Fun into Your Mobile Device and Cell Phone (Technology in Action)	Apress	2007

Serial number: 12

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Semantic Technologies**			
2.	Code	23ISE22B060			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	First year / second semester	7.	Number of ECTS credits	6
8.	A teacher	Assistant prof. dr. Fisnik Doko			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** This course is an introductory course covering the semantic web languages RDF (S), OWL and SPARQL. The course is a combination of lectures covering the practical and theoretical aspects of the aforementioned languages and extensive practical sessions on modeling and querying semantic knowledge bases.				
11.	**Course Content:** WEB 2.0. Examples of WEB 2.0. WEB 2.0 and user generated content. Social networks and collective intelligence. WEB 2.0 technologies. Impact of Web 2.0 on business and society. Web 2.x technologies. Web services and cloud computing. Web 3.0 and Semantic Web Concepts. Web 3.0 technologies. Web 3.0 applications and web data management. Security of web services. Management of web services. Mobile web services. Future trends in the development of web technologies and services. A framework for describing resources. General idea of graph-based data representation and basic concepts Expert RDF ternary language. Advanced functions for RDF. Tips for Publishing RDF Data RDF Schema (RDFS). A discussion of the added value of an instance-driven schema. Syntax and semantics of basic features: classes, properties and their characteristics. Relationships between RDFS dictionary elements. Computers answer typical searches across RDFS datasets RDFS satisfiability and existence. Using Protege to Model and Search RDFS Datasets Limitations of RDFS. Searching the Semantic Web with SPARQL. Querying Datasets with the SPARQL StarDog Engine Filters and SPARQL Expressions Property Path Names. Complex graphics schemes with advanced features such as optional sections, aggregation and ordering. Other types of queries Update with SPARQL. OWL Web Ontology Language. Basic concepts and differences in RDFS Overview of OWL modeling constructs. Modeling and assessing the benefits of alternative models in a specific application context. Interchangeability of construction models. A discussion of the trade-off between expressiveness of lan-calculation modeling and computational efficiency in searching OWL profiles. Limits on the expressive power of OWL.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				

	17.1.	Tests		70 points
	17.2.	Individual work/project (presentation: written and oral)		20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises	
20.	Language of instruction		Albanian, Macedonian and English language	
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students	

22. Literature

22.1. Required reading

Ord. number	Author	Title	Publisher	Year
1.	Serge Abiteboul, Ioana Manolescu, Philippe Rigaux, Marie-Christine Rousset, Pierre Senellart	Web data Management	Cambridge University Press	2012
2.	Michael P. Papazoglou	Web Services: Principles and Technology	Pearson Education Limited	2008
3.	Grigoris Antoniou and Frank van Harmelen	A Semantic Web Primer, 2nd Edition	The MIT Press	2008

22.2. Additional literature

Ord. number	Author	Title	Publisher	Year
1.	Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph	Foundations of Semantic Web Technologies	Chapman & Hall/CRC	2010

		2.	John Davies (Editor), Rudi Studer (Co-Editor), Paul Warren (Co-Editor)	Semantic Web Technologies: Trends and Research in Ontology- based Systems	Addison Wesley (5th Edition)	2009
		3.				

Serial number: 13

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Applied Web Programming**			
2.	Code	23ISE23A010			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / third semester	7.	Number of ECTS credits	6
8.	A teacher	Prof. dr. Bekim Fetaji			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** The aim of the course is to familiarize students with the problems of web development and understanding of web object-oriented programming techniques and technologies. To have an understanding of a range of different programming techniques and languages that are available to organizations and enterprises and to be able to choose an appropriate architecture for the web application. - Be able to demonstrate web development design and implementation capabilities. - To be able to make informed and critical decisions regarding web development - Be able to design and implement reasonably sophisticated web applications using one or more appropriate technologies. - Have the knowledge to critically analyze and evaluate web applications. - To have a critical and systematic understanding of web protocols - To become familiar with more technologies for web development, the syntax of script languages, as well as programming languages and learn the basics and concepts of programming; learn to pay attention to code clarity and documentation - Analysis of key OOP concepts: classes and objects, inheritance and event-driven calculations. - Acquired skills in designing software solutions to problems from different areas of application.				
11.	**Course Content:** Description of existing web technologies; Analysis of basic concepts and principles of web programming. AJAX technologies with elements of the HTML 5 language, dynamic web pages, dynamic web-based applications, development and future in Internet communications, new technologies, elements of the Java programming language, control structures, Methods and Functions, Graphical User Interfaces, applets, JSP -java server pages, JSF-java server faces, and new java technologies such as JavaFX, working with databases, analysis of various application case studies with examples from companies.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	

	17.2.	Individual work/project (presentation: written and oral)	20 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	Attendance 80% of the teaching Submitted individual works and Completed duties of exercises	
20.	Language of instruction	Albanian, Macedonian and English language	
21.	A method of monitoring the quality of teaching	Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students	

22. Literature

22.1. Required reading

Ord. number	Author	Title	Publisher	Year
1.	Paul J. Deitel	Java How to Program, Early Objects, 11th edition	Prentice Hall	2018
2.	Paul J. Deitel	AJAX, Rich Internet Applications, and Web Development for Programmers	Pearson Education Limited	2005
3.				

22.2. Additional literature

Ord. number	Author	Title	Publisher	Year
1.	Don Gosselin	PHP Programming with MySQL	Prentice Hall	2004
2.				
3.				

Serial number: 14

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Applied Parallel Programming**			
2.	Code	23ISE23A020			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / third semester	7.	Number of ECTS credits	6
8.	A teacher	Assistant prof. dr. Stojan Kitanov			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** A survey of programming algorithms and techniques on the latest shared-memory and distributed-memory parallel platforms. The student will get acquainted with the theoretical and practical (program) components.				
11.	**Course Content:** Basic concepts. Introduction and parallel programming platforms, parallel algorithm design principles, concurrent processes, basic communication operations, and analytical modeling of parallel programs. Parallel programming using a platform with a shared address space (representatives: threads and OpenMP), as well as multi-core processors. An introduction to parallel programming using the message exchange paradigm (MPI representative). Parallel programming using multi-core GPUs (representative CUDA and OpenCL). Parallel Algorithms and Applications. Dynamic programming. Parallel programming in .NET. Parallel programming languages with a global view. ZPL.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises		
20.	Language of instruction		Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		
22.	Literature				
	22.1.	Required reading			
		Ord. number	Author	Title	Publisher	Year
		1.	Calvin Lyn, Lawrence Snyder	Principles of Parallel Programming	Pearson Addison Wesley	2009
		2.	Andrew Sheppard (Author)	Programming GPUs	O'Reilly Media	2012
		3.	Maurice Herlihy, NirShavit	The Art of Multiprocessor Programming	Elsevier Science & Technology Books	2008
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.	Rohit Chandra et al.	Parallel Programming in OpenMP	Morgan Kaufmann Publishers	2000
		2.	Ananth Grama et al.	Introduction to Parallel Programming	Addison Wesley	2003
		3.	Peter Pacheco	Parallel Programming with MPI	Morgan Kaufmann	1996

Serial number: 15

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Software Project Management**			
2.	Code	23ISE23A030			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / third semester	7.	Number of ECTS credits	6
8.	A teacher	Assistant prof. dr. Fisnik Doko			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Analysis and application of practical skills in the field of software project management, presenting techniques and approaches and in order to develop a critical awareness of the challenges and shortcomings in this field. The module is based on knowledge of software engineering and other courses in the field of information systems.				
11.	**Course Content:** The broad structure of this course aims to demonstrate its different objectives, and lead to two identified themes: The first theme is an introduction and study of techniques and concepts with a focus on software project management; The second topic takes a more critical look at project management software, its suitability in software systems development. The structure of the content topic in detail is as follows: 1. Project Profile 2. understanding and structure of tasks within a project 3. assessment and risk 4. planning and resources 5. monitoring and control 6. quality assurance 7. maintenance 8. the project team and the project manager 9. alternative approaches and new questions.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises		
20.	Language of instruction		Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		
22.	Literature				
	22.1.	Required reading			
		Ord. number	Author	Title	Publisher	Year
		1.	Bob Hughes, Mike Cotterell	Software Project Management	McGraw-Hill Education	2010
		2.				
		3.				
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.				
		2.				
		3.				

Serial number: 16

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Applied Artificial Intelligence**			
2.	Code	23ISE23A040			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / third semester	7.	Number of ECTS credits	6
8.	A teacher	Prof. dr. Aleksandar Dimovski			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** The student will be trained to use advanced algorithms and techniques in the field of Artificial Intelligence.				
11.	**Course Content:** This is an open course where the candidate will be able to choose to work on a project related to the latest developments in the field of artificial intelligence (AI). Possible topics include the following areas: natural language processing (text understanding, machine and machine-assisted translation, statistical natural language processing, and more); metaphorical reasoning and reasoning by analogy; theoretical AI (new trends in AI theory; AI and legal reasoning, AI ethics); cyborg theory, and more. alternative approaches and new questions.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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	Attendance 80% of the teaching Submitted individual works and Completed duties of exercises			

20.	Language of instruction			Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching			Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		
22.	Literature					
	22.1.	Required reading				
		Ord. number	Author	Title	Publisher	Year
		1.	Stuart Russell, Peter Norvig	Artificial Intelligence: A Modern Approach	Prentice Hall	2012
		2.				
		3.				
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.	Eric Matthes	Python Crash Course: A Hands-On, Project-Based Introduction to Programming	No Starch Press	2015
		2.	Prateek Joshi	Artificial Intelligence with Python: A Comprehensive Guide to Building Intelligent Apps for Python Beginners and Developers	Packt Publishing	2017
		3.				

Serial number: 17

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Modelling and Simulations**			
2.	Code	23ISE23B050			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / third semester	7.	Number of ECTS credits	6
8.	A teacher	Prof. dr. Zoran Gacovski			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Students should acquire theoretical knowledge of different types of media, as well as practical knowledge of programs for their processing. The student will acquire knowledge of using modeling techniques in order to evaluate the dynamic behavior of real systems. The student will be equipped with knowledge of constructing, verifying and solving models with an appropriate level of abstraction and detail.				
11.	**Course Content:** Introduction to Modeling and Simulations: Computer, Physical and Mathematical Models. Computer, physical and mathematical models. Approaches to describing and modeling simulations. Monte Carlo simulations. Random number generators, random number tests and using random numbers. Techniques for determining sensitivity. Optimization techniques based on simulations. Simulating discrete systems. Simulating continuous systems. Simulating queuing systems: basics of queuing theory and their simulation. Markov chains. Classification of conditions. Exponential distribution. Poisson process. Unbroken Markov Chains. An introduction to queuing theory. Queue M/M/1, M/M/n. Queuing networks. Simulations of discrete random variables. Simulations of continuous random variables. Systems dynamics: exponential growth and decay models, logistic models and biological models. Metamodeling and simulating goal achievement. What-if analysis techniques.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .		2 x 15 = 30 hours
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.		1 x 15 = 15 hours
16.	Other forms of activities	16.1.	Project tasks		45 hours
		16.2.	Independent tasks		30 hours
		16.3.	Home study - assignments		60 hours
17.	Method of assessment				
	17.1.	Tests			70 points
	17.2.	Individual work/project (presentation: written and oral)			20 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	Attendance 80% of the teaching Submitted individual works and Completed duties of exercises	
20.	Language of instruction	Albanian, Macedonian and English language	
21.	A method of monitoring the quality of teaching	Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students	

22. Literature

22.1. Required reading

Ord. number	Author	Title	Publisher	Year
1.	J.Banks, J.Carson, B.Nelsonand D.Nikol	Discrete Event System Simulation	Prentice Hall	2004
2.	J. A. Sokolowski and C. M. Banks	Discrete Event System Simulation Prentice Hall 2004 2. J. A. Sokolowski and C. M. Banks Principles of Modeling and Simulation: A Multidisciplinary Approach	Wiley	2009
3.	V. P. Singh	System modeling and simulation	New Age International Publishers	2009

22.2. Additional literature

Ord. number	Author	Title	Publisher	Year
1.	Gregoire Alaire, Alan Craig	Numerical Analysis and Optimization: An Introduction to	Oxford University Press	2007
2.	Loius G. Birta, Gilbert Arbez	Modelling and Simulation: Exploring Dynamic System Behaviour	Springer	2011
3.	Bernard P. Zaiger, Herbert Praehofer, Tag Gon Kim	Theory of Modeling and Simulation, Second Edition	Academic Press; 2 edition	2000

Serial number: 18

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Programming in Cloud**			
2.	Code	23ISE23B060			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / third semester	7.	Number of ECTS credits	6
8.	A teacher	Assistant prof. dr. Fisnik Doko			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Cloud computing is a contemporary trend of using computer architectures, in the form of sharing infrastructure, platform or services. The design approach based on Service Oriented Architectures (SOA) allows applications to offer and use services from other applications that exist on different platforms. This offers a stark contrast to the existing monolithic software architecture by opening up the possibility of reusable, flexible, scalable and cost-effective solutions. Web services technologies, which currently generally use web-based protocols, are the main means by which SOAs are used and allow wide possibilities of interoperability of systems over the Internet. The purpose of this course is for students to become familiar with SOA principles and how they can be applied in mass software systems. Students will be introduced to the technologies associated with web service standards and the use of these technologies to access services as clients and enable server-side services. SOA is a platform for the development of cloud solutions and Internet computing. Virtualization is necessary when moving to cloud solutions. The course will specifically consider the possible ways of realizing virtualization, IaaS, PaaS and SaaS, as well as interoperability of the solutions.				
11.	**Course Content:** SOA principles and characteristics The main elements of web service standards including XML, SOAP, WSDL and UDDI Advanced aspects of web services including managing multiple services, security of multiple services Principles and features of cloud computing Virtualization, IaaS, PaaS SaaS – building software as a service Interoperability of software services				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				

	17.1.	Tests	70 points
	17.2.	Individual work/project (presentation: written and oral)	20 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	Attendance 80% of the teaching Submitted individual works and Completed duties of exercises	
20.	Language of instruction	Albanian, Macedonian and English language	
21.	A method of monitoring the quality of teaching	Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students	

22. Literature

22.1. Required reading

Ord. number	Author	Title	Publisher	Year
1.	Thomas Erl	Service-Oriented Architectupe, Concept, Technology And Design	Prentice Hall	2008
2.	Thomas Erl	Cloud Computing:Automating the VirtualizedData Center (Networking Technology)	Cisco Press	2011
3.				

22.2. Additional literature

Ord. number	Author	Title	Publisher	Year
1.	Toby Velte, Anthony Velte, Robert Elsenpeter	Cloud Computing, A Practical Approach	McGraw-Hill	2004
2.				
3.				

Serial number: 19

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Applied Data Science**			
2.	Code	23ISE24A010			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / fourth semester	7.	Number of ECTS credits	6
8.	A teacher	Prof. dr. Bekim Fetaji			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Familiarity with the concept of Data Science, statistical analysis of data, application of algorithms for Machine Intelligence. With this course, the student will gain knowledge about the practical use of tools and software for data processing, developing models, evaluating and comparing results. You will also gain theoretical and practical knowledge with tools for working with Data Warehouses and Big Data Sets.				
11.	**Course Content:** Introduction to data science and data analysis with machine intelligence algorithms. Work with data sets, preparation of data sets, application of Machine Intelligence algorithms: Decision Trees, Naive Bayes, Random Forests, Ensembles of models. Data processing (extraction and filtering), attribute extraction, building classification and regression models, data clustering, visualization of data and models, as well as analysis and comparison of different types of evaluation of the built models. Large data sets and data repositories.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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)	

<table>
<tr><td></td><td colspan="3"></td><td>from 81 to 90 points</td><td>9 (nine) (B)</td></tr>
<tr><td></td><td colspan="3"></td><td>from 91 to 100 points</td><td>10 (ten) (A)</td></tr>
<tr><td>19.</td><td colspan="3">Requirement for signature and passing the final exam</td><td colspan="2">Attendance 80% of the teaching
Submitted individual works and
Completed duties of exercises</td></tr>
<tr><td>20.</td><td colspan="3">Language of instruction</td><td colspan="2">Albanian, Macedonian and English language</td></tr>
<tr><td>21.</td><td colspan="3">A method of monitoring the quality of teaching</td><td colspan="2">Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students</td></tr>
<tr><td rowspan="11">22.</td><td colspan="5">Literature</td></tr>
<tr><td rowspan="4">22.1.</td><td colspan="5">Required reading</td></tr>
<tr><td>Ord. number</td><td>Author</td><td>Title</td><td>Publisher</td><td>Year</td></tr>
<tr><td>1.</td><td>Aurélien Géron</td><td>Hands-On Machine Learning with Scikit-Learn and TensorFlow</td><td>O’Reilly Media; 1st edition (April 25, 2017)</td><td>2017</td></tr>
<tr><td>2.</td><td>Ian H. Witten, Eibe Frank, Eibe Frank</td><td>Data Mining: Practical Machine Learning Tools and Techniques</td><td>Morgan Kaufmann; 3rd edition (January 20, 2011)</td><td>2011</td></tr>
<tr><td>3.</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="5">22.2.</td><td colspan="5">Additional literature</td></tr>
<tr><td>Ord. number</td><td>Author</td><td>Title</td><td>Publisher</td><td>Year</td></tr>
<tr><td>1.</td><td>Viktor Mayer-Shonberger and Kenneth Cukier</td><td>Big Data: A Revolution That Will Transform How We Live, Work and Think</td><td>Elsevier</td><td>2013</td></tr>
<tr><td>2.</td><td>David Loshin</td><td>Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph</td><td>Wiley</td><td>2011</td></tr>
<tr><td>3.</td><td></td><td></td><td></td><td></td></tr>
</table>

Serial number: 20

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Individual Software Project**			
2.	Code	23ISE24A020			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / fourth semester	7.	Number of ECTS credits	6
8.	A teacher	Assistant prof. dr. Stojan Kitanov			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Oriented individual work in computer laboratories. Application of digitalization. E-presentation. Development of various software solutions, digital contents. Tools for digitization, image processing, bitmaps, vector-oriented image processors and others.				
11.	**Course Content:** Software packages for development, multimedia, graphics, sound, animation, special effects, sound processing, multimedia content production, video recording processing, web multimedia content preparation.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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	Attendance 80% of the teaching Submitted individual works and Completed duties of exercises			
20.	Language of instruction	Albanian, Macedonian and English language			
21.	A method of monitoring the quality of	Quizzes, post-unit tests, progress monitoring, internal			

	teaching			evaluation and survey of students		
22.	Literature					
	22.1.	Required reading				
		Ord. number	Author	Title	Publisher	Year
		1.	R. S. Pressman	Software Engineering: A Practiontionner Approach	McGraw-Hill	2008
		2.	Jia Liu	Metadata and Its Applications inthe Digital Library: Approachesand Practices	Libraries Unlimited	2007
		3.				
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.	G. G. Chowdhury, Sudatta Chowdhury	Introduction to Digital Libraries	Facet Publishing	2002
		2.	Terry Reese	Building Digital Libraries: A How-to do it Manual	Neal Schuman Publishers	2007
		3.				

Serial number: 21

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Theory of Numbers and its Application in Cryptography**			
2.	Code	23ISE24A030			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / fourth semester	7.	Number of ECTS credits	6
8.	A teacher	Prof. dr. Aleksandar Dimovski			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** The aim of this course is to introduce students to the basic concepts of Cryptology as a science and especially to Cryptography as a branch, the basic cryptographic extensions and their practical applications.				
11.	**Course Content:** Data security and cryptography, need for cryptography development, symmetric and asymmetric models as basic concepts, traditional encryption, Caesar cipher, mono-alphabetic encryption, transposition encryption, Vernam, Wigner, Playfar, types of attacks, data integrity, authentication codes, hash functions, public key cryptography, cryptosystems, digital signatures, public key infrastructure (PKI), differences and advantages of DES algorithms and 3 DES, AES and RSA algorithms, key exchange protocols, digital steganography.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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	Attendance 80% of the teaching			

<table>
<tr><td></td><td colspan="2">the final exam</td><td colspan="4">Submitted individual works and
Completed duties of exercises</td></tr>
<tr><td>20.</td><td colspan="2">Language of instruction</td><td colspan="4">Albanian, Macedonian and English language</td></tr>
<tr><td>21.</td><td colspan="2">A method of monitoring the quality of teaching</td><td colspan="4">Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students</td></tr>
<tr><td rowspan="11">22.</td><td colspan="6">Literature</td></tr>
<tr><td rowspan="5">22.1.</td><td colspan="5">Required reading</td></tr>
<tr><td>Ord. number</td><td>Author</td><td>Title</td><td>Publisher</td><td>Year</td></tr>
<tr><td>1.</td><td>S. Vaudenay</td><td>A Classical Introduction to Cryptography: Applications for Communications Security</td><td>Springer Science+Business Media, Inc 2006</td><td>2006</td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="5">22.2.</td><td colspan="5">Additional literature</td></tr>
<tr><td>Ord. number</td><td>Author</td><td>Title</td><td>Publisher</td><td>Year</td></tr>
<tr><td>1.</td><td>N. Smart</td><td>Introduction to Modern Cryptography</td><td>Chapman & Hall/CRC Press 2007</td><td>2007</td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td></tr>
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Serial number: 22

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Master Thesis**			
2.	Code	23ISE22A040			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / fourth semester	7.	Number of ECTS credits	6
8.	A teacher	The teaching staff of the Faculty of Information Sciences and the University "Mother Teresa" in Skopje can be a mentor for a master's thesis			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** Students aim to develop a software application and analyze it in detail, using knowledge from the subjects they have followed during their studies.				
11.	**Course Content:** Each student works individually with the help of the chosen mentor on the chosen topic, which it must be previously approved by the Teaching and Research Council of the Faculty of Information Sciences. After completing the mentoring phase and checking the student's file, the student submits an Application for the public defense of the master's thesis before the Commission and the audience to the Teaching and Research Council of the Faculty of Information Sciences during the regular examination session. If the Educational Scientific Council of the Faculty of Information Sciences accepts the Application, the Educational Scientific Council of the Faculty of Information Sciences makes a decision on the establishment of a commission for the review of the master's thesis, which includes the mentor as a member. If the Academic Scientific Council of the Faculty of Information Sciences accepts the peer review, the Academic Scientific Council of the Faculty of Information Sciences makes a decision on the formation of a committee for the public defense of the master's thesis, which includes the mentor as a member. Then as the final act is the public defense of the master's thesis before a committee and an audience.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2			
15.	Forms of teaching activities	15.1.	Consultations	2 x 15 = 30 hours	
		15.2.			
16.	Other forms of activities	16.1.	Independent learning and working	150 hours	
		16.2.			
		16.3.			
17.	Method of assessment				
	17.1.	Individual work/project (presentation: written and oral)		80 points	
	17.2.	Activity and participation		20 points	
	17.3.				
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			Passed all courses in the study program		
20.	Language of instruction			Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching			Mechanisms of internal evaluation and surveys		
22.	Literature					
	22.1.	Required reading				
		Ord. number	Author	Title	Publisher	Year
		1.				
		2.				
		3.				
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.				
		2.				
		3.				

Serial number: 23

Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Management of Information Systems**			
2.	Code	23ISE24B050			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / fourth semester	7.	Number of ECTS credits	6
8.	A teacher	Assistant prof. dr. Majlinda Axhiu			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** After completing the course, the student is expected to understand and have in-depth knowledge in the application of models and techniques for management of management information systems, to have in-depth knowledge of the goals of business and e-business systems, to know how to establish a digital organization, to have in-depth knowledge of the approaches to the implementation of mass IS, to have a broad knowledge of determining key applications and paradigms in a company, to know the current conditions in the digital era, to know how to apply IS in carrying out strategies ski decisions, to have basic knowledge of ethical behavior as an IT manager and to know how to apply security frameworks to 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 (management) and types of management within a company (with special reference to IS management goals), digital organization, security management and ethics in IS 4. Contributory IS in the work of a company (strategic, competitive, operational level) 5. ICT infrastructure and its influence on the development of IS in a company, IT mass systems 6. Key applications and paradigms as they are determined in relation to the company's strategic goals (eg 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 the management of information systems				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				

	17.1.	Tests		70 points
	17.2.	Individual work/project (presentation: written and oral)		20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises	
20.	Language of instruction		Albanian, Macedonian and English language	
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students	

22.	Literature					
	22.1.	Required reading				
		Ord. number	Author	Title	Publisher	Year
		1.	Kenneth. C. Laudon Jane. P. Laudon	Management Information Systems: Managing the Digital Firm(13thEdition)	Prentice Hall	2013
		2.	James A. O'Brien, George Marakas	Management Information System	McGrawHill/Irwin; 9th edition	2008
		3.				
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.				
		2.				
		3.				

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Attachment No. 3		**Course program from the second cycle of studies**			
1.	Name of the course	**Analysis and Performances of Wireless Networks**			
2.	Code	23ISE24B060			
3.	Study program	Applied Software Engineering, two years studies			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Mother Teresa University Faculty of Information Sciences, Skopje			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Second year / fourth semester	7.	Number of ECTS credits	6
8.	A teacher	Assistant prof. dr. Stojan Kitanov			
9.	Prerequisites for enrolling in the course	None			
10.	**Course objectives (competencies):** To supplement the basic knowledge in the field of mobile and wireless networks with a more in-depth performance analysis following the basic development components and directions in the development of wireless networks. Various network aspects (convergence, heterogeneity, vertical handover, clustering, cognition, mobility, etc.). Knowledge of the development component of advanced RAN solutions. Use of analytical and simulation tools for design, analysis and optimization.				
11.	**Course Content:** New network concepts in the wireless domain (5G and beyond). LTE/LTE-A and various capabilities and features. Innovative aspects (eg carrier aggregation, load shedding). New standards (eg IEEE802.11af/ac/ad). Convergence of networks, devices and services. Heterogeneous Wireless Networks (HetNets): Architectures and Issues. Specific network aspects (MAC, routing, etc.). Performance of small femto cells. Performance of heterogeneous network structures in terms of throughput, delay, jitter. Resource management in various wireless network solutions. Vertical Handover Performance Analysis. Multihoming paradigm. New standards for interoperability and analysis of their performance. M2M and D2D concepts. Cognitive radio devices and their impact on the performance of future wireless networks. Ad hoc networking. MEC. Localization. Mobility management in heterogeneous network structures.				
12.	Learning methods: interactive teaching, practical teaching, laboratory exercises, seminar work.				
13.	Total available time	180 hours			
14.	Allocation of available time	2+1			
15.	Forms of teaching activities	15.1.	Lectures - theoretical teaching .	2 x 15 = 30 hours	
		15.2.	Exercises (laboratory, classroom), seminars, teamwork.	1 x 15 = 15 hours	
16.	Other forms of activities	16.1.	Project tasks	45 hours	
		16.2.	Independent tasks	30 hours	
		16.3.	Home study - assignments	60 hours	
17.	Method of assessment				
	17.1.	Tests		70 points	
	17.2.	Individual work/project (presentation: written and oral)		20 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		Attendance 80% of the teaching Submitted individual works and Completed duties of exercises		
20.	Language of instruction		Albanian, Macedonian and English language		
21.	A method of monitoring the quality of teaching		Quizzes, post-unit tests, progress monitoring, internal evaluation and survey of students		
22.	Literature				
	22.1.	Required reading			
		Ord. number	Author	Title	Publisher	Year
		1.	Khaldoun Al Agha, Guy Pujolle, Tara Ali Yahiya	Mobile and Wireless Networks	Wiley-ISTE	2016
		2.	Geyong Ming, Yi Pan, Pingzhi Fan (Ed.)	Advances in Wireless Networks: Performance Modelling, Analysis and Enhancement (Wireless Networks and Mobile Computing	NOVA Science Pbls	2008
		3.				
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.	Piet Van Mieghem	Performance Analysis of Complex Networks and Systems	Cambridge University Press	2014
		2.				
		3.				