University of Ioannina

Department of Informatics and Telecommunications

GUIDE
UNDERGRADUATE STUDIES
2022 - 2023

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Academic year/semester dates

- The academic year begins on September 1st of each year and ends on July 5th of the following year and includes two independent academic semesters, the winter and the spring.
- The winter semester begins on the first Monday after the September exams and the week of course declarations.
- The spring semester begins after the end of the winter semester exams and the week of course declarations

ΠΙΝΑΚΑΣ ΠΕΡΙΕΧΟΜΕΝΩΝ

Περιεχόμενα

Prologue

The Department of Informatics and Telecommunications was founded in 2018 within the Faculty of the same name at the University of Ioannina. Its main mission is to cultivate the science of Informatics, Computer Networks and Telecommunications, as well as their various applications.

This Study Guide provides general information about the University of Ioannina and the Department. It also presents in detail the regulation and the content of the courses of the Undergraduate Study Program.

The aim of the department is for its students to acquire a solid scientific basis and substantial research as well as practical experience in the cognitive areas of Information Technology and Telecommunications. The professional rights of the graduates of the Department are guaranteed by the P.D. 44/08-04-2009 and are equal to those of graduates of relevant Departments of Greek Universities.

The Department is housed in the buildings of the School of Informatics and Telecommunications, which are located on the University campus on the outskirts of the city of Arta. Regular bus routes connect the Department with the city center and the intercity bus station.

Aim of the Department

The mission of the Department is to provide high-level education, know-how and specialization, as well as the development of scientific and technological research in emerging fields of Informatics and Telecommunications, in order to create executives of high scientific level. The two-dimensional approach to the subjects of Informatics and Telecommunications, allows the creation of highly skilled and attractive professionals in the labor market.

The Department of Informatics and Telecommunications has had a twenty-year run, strengthening over time its academic position in an increasingly competitive environment. Along the way, the driving force and guide is the new developments and trends in informatics and telecommunications, so that the professional profile and scientific skills of graduates are in line with the modern requirements and needs of technology, can follow future developments and contribute to the promotion of science.

The main purpose of the Department is the development of intense educational and research activity in the modern areas of Informatics and Telecommunications. For the academic community of the department, it is important to produce new knowledge and train graduates capable of designing, developing and contributing to the production of Informatics, computational and Telecommunication systems and Services, which meet every need, create new possibilities and cover all population groups.

The modern academic environment requires immediate and flexible adaptation of the education and research provided to the current and upcoming conditions, as they are shaped in a globalized and competitive context. The evolution in the scientific areas covered by the Department shows almost exponential progress, as new scientific fields emerge and develop widely, attracting the interest of the scientific community. Indicatively mentioned are: Artificial Intelligence, Big Data Processing and Analysis, new generations of Mobile Communications and services, Tele-education and Teleworking services, the adoption of Augmented and Virtual Reality in education, the design and development of advanced methods of Automated Medical Diagnosis, the application of Gamification in a number of sectors of the modern economy, the rapid adoption of Cryptocurrencies and blockchain technologies, "Smart" Sensors, the Internet of Things (IoT) and Services (IoS), the digital transformation and the Fourth Industrial Revolution (I4.0), which combined with cloud computing highlight the need for Cybersecurity and shielding of computer systems and internet services.

The Professors of the Department have a large number of published work in leading scientific journals, have developed important international collaborations with relevant departments abroad and participate in scientific committees of international journals and conferences of recognized prestige. The professional rights of the graduates of the Department are guaranteed by the Presidential Decree 44/08-04-2009 and are equivalent to those of graduates of related Departments of Greek Universities.

Organization

The Department of Informatics and Telecommunications of the University of Ioannina is based in the city of Arta. The department operates in two modern buildings at the University Campus of Kostakioi in Arta. With over 500 active students, 18 members of Teaching and Research Staff, a master's and doctoral degree program and 4 research laboratories with doctoral and postdoctoral researchers, the Department of Informatics & Telecommunications is an active cell for the production of knowledge and opportunities for young people seeking a successful career in the field of Informatics and Telecommunications.

The main purpose of the Department is the development of intense research activity in modern areas of Informatics and Telecommunications, and the participation in national and European research and development projects to attract external resources.

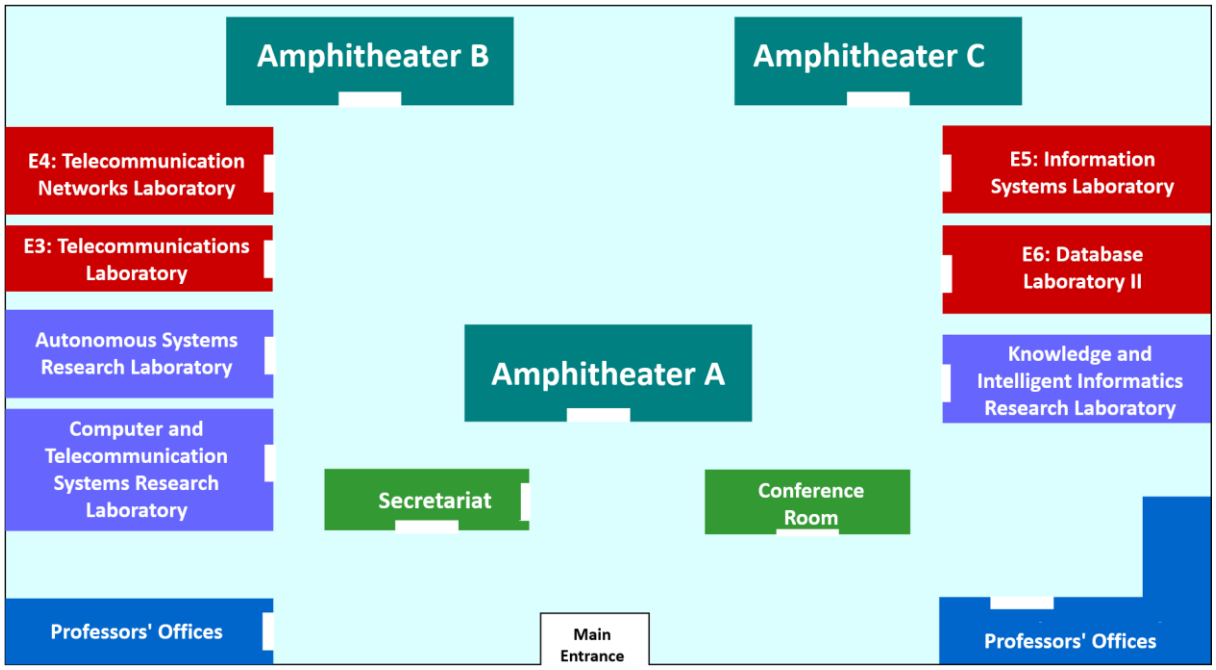
The Professors of the Department have a large number of published work in leading scientific journals, have developed important international collaborations with relevant departments abroad and participate in scientific committees of international journals and conferences of recognized prestige. The professional rights of the graduates of the Department are equivalent to those of graduates of related Departments of Greek Universities.
The Organs of the Department

The Organs of the department are the General Assembly and the President of the department. The Assembly consists of the professors of the Department and representatives of the members of the Special Technical Laboratory Staff, and the students of the Department. The dean of the faculty and president of the department is Professor Euripides Glavas.

For the proper academic and administrative functioning, the department establishes advisory committees. The members of the committees are appointed by the Assembly of the department, on the recommendation of the president. Indicatively, the following committees are mentioned: Committee for Undergraduate Studies
Postgraduate Program Committee
Doctoral Studies Committee
Internal Evaluation Committee of the department
Research Committee of the Department
Public Relations, Website & social media and Alumni Committee
Internship Committee
Committee for Laboratory Teaching Infrastructures of Building Infrastructure, Network Infrastructure & Security
Ethics Committee
Building Infrastructure and Laboratories The Department has modern infrastructure (building and laboratory) for teaching as well as for serving other needs such as research, training seminars, etc. More specifically, it has the following:
Main building
Secondary building
Laboratory room in the Floriculture building
Use of the Library's infrastructure (reading room and printing center, in the immediate vicinity of the Secondary building).

All areas are accessible to people with mobility problems and provision is made (where appropriate) for the facilitation of people with disabilities.

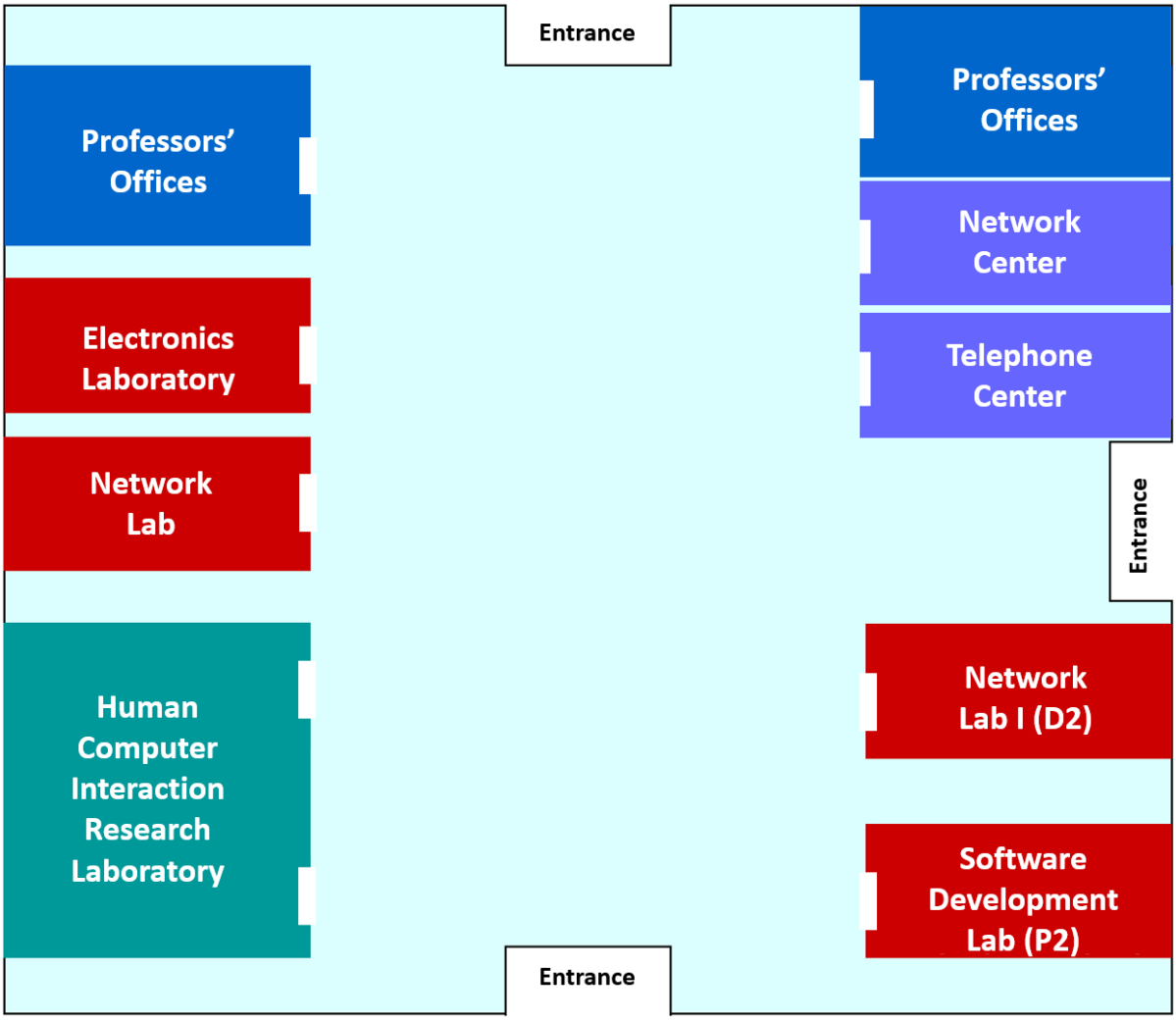
Main building



In the main building there are:
One Amphitheatre (A) and two Classrooms (B) and (C)
Meeting and teleconferencing room
3 Research Laboratories
4 Teaching laboratories

In the building there is the Secretariat of the department, the Professors' Offices and the network and computing infrastructure room of the department (computer room). Both the central Ampitheater and the two rooms are equipped with computers and modern visual presentation systems. Students of the Department have access to modern UNIX environment computer systems, as well as a sufficient number of personal computers, all connected to the Department's network. Students are trained in fully equipped laboratories of informatics, databases, electronics, telecommunications, networks, logical design and computer architecture. All laboratories are equipped with computers (15/20 in every room) and presentation supervisory systems. Finally, the infrastructure of the Department complements the infrastructure of the research laboratories.

The auxiliary building (prefabricated)



The auxiliary building of the department has 7 Laboratories, professors and teaching Staff offices and hosts the network management center of the campus.
Room-Laboratory in the building of the Floriculture

This room is used for the laboratory of the course "Computer Architecture". The above laboratories are supervised by the laboratory and teaching infrastructure committee of the department. They mainly serve the laboratory activities of 64 courses of the Department of Informatics and Telecommunications.

Curriculum of School of Informatics and Telecommunications

Duration of studies

The normal course of study is 8 semesters, and each course of the Department is integrated into one of them. Students admitted to the Department follow the Undergraduate Program «Informatics and Telecommunications» (ISCED codes: 061 “Information and Communication Technologies” και 0714 “Electronics and Automation”), which leads to the degree of Informatics and Telecommunications, of level 6 according to the National Qualifications Framework. After the award of the degree, the graduates go beyond their respective careers, can continue their studies for the puprose of earning Master of Science (MSc) degree of level 7 and/or Ph.D. degree of level8.

Curriculum Structure

Student must first attend 30 compulsory courses that cover an extensive, but necessary, cognitive science suite in Informatics and Telecommunications, common to all students. The courses are divided into:

- Background Courses (8 lessons)
- Scientific Area (22 courses)

The student also chooses a Skill Development course. The student then delves into the areas they wish, depending on their own choice of courses, from the 5 available courses.

Course Streams

Each stream has a set of (5 to 7) courses, which provides specialized technical knowledge on the subject. The courses supported by the department are as follows:

- Course FLOW: SOFTWARE

- Course FLOW: INTELLIGENT SYSTEMS AND APPLICATIONS
- Course FLOW: COMPUTER SYSTEMS
- Course Flow: TELECOMMUNICATIONS
- Course FLOW: NETWORKS

Course categories

- Core Course (C):

The core courses (C) are offered in the first 6 semesters of the program and are common and compulsory for all students.

- Skill Development Courses (SD):

Skill development courses are offered int the 6th semester.

- Elective Courses Compulsory (EC):

They are structured in eight 'Flows' courses and are offered in the6th, 7th και 8th semester.

Thesis

The thesisis not compulsory and is prepared during the 7th and 8th semesters.

Practical Experience (Workshop)

In the new curriculum the practical experience is offered after the 6th semester on an optional basis, for a period of 2 months, and takes place in both the public and private sectors, as well as in European Union operations in the context of European programs. Students must have at least 25 compulsory courses previously required to participate.

Course Tables per Semester and Flow

1st Semester

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
101	R	LINEAR ALGEBRA	5	4	1	-	5
102	R	MATHEMATICAL ANALYSIS	5	4	1	-	7
103	R	PROGRAMMING I	5	3	-	2	7
104	R	LOGIC DESIGN	5	4	-	1	5
105	R	ANALOG ELECTRONICS	5	3	-	2	6
		Summary:	**25**	**18**	**2**	**5**	**30**

2nd Semester

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
201	R	PRINCIPLES OF ELECTROMAGNETICS & TELECOMMUNICATIONS	5	4	1	-	6
202	R	PROTOCOLS AND ARCHITECTURAL NETWORKS	5	4	-	1	6
203	R	DISCRETE MATHEMATICS	5	4	1	-	6

204	R	PROGRAMMING II	5	3	-	2	7
205	R	DIGITAL ELECTRONICS	5	3	-	2	5
		Summary:	**25**	**18**	**2**	**5**	**30**

3rd Semester

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
301	R	COMPUTER ARCHITECTURE	5	3	-	2	6
302	R	OBJECT ORIENTED PROGRAMMING	5	4	-	1	7
303	R	SIGNALS & SYSTEMS	5	4	1	-	6
304	R	SIGNAL DISTRIBUTION	5	4	1	-	5
305	R	DATA STRUCTURES	5	4	-	1	6
		Summary:	**25**	**19**	**2**	**5**	**30**

4th Semester

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
401	R	PRINCIPLES OF LANGUAGE PLANNING	5	4	-	1	6
402	R	OPERATING SYSTEMS	5	3	-	2	7
403	R	COMPUTER NETWORKS	5	4	-	1	6
404	R	DATABASES	5	4	-	1	6
405	R	POSSIBILITIES & STATISTICS	5	4	1	-	5
		Summary:	**25**	**19**	**1**	**5**	**30**

5th Semester

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
501	R	INTEGRATED SYSTEMS	4	3	-	1	5
502	R	ARTIFICIAL INTELLIGENCE	5	3	-	2	5
503	R	DIGITAL TELECOMMUNICATIONS	5	3	-	2	5
504	R	ALGORITHMS & COMPLEXITY	4	3	1	-	5
505	R	SOFTWARE TECHNOLOGY	5	3	-	2	5

506	R	BROADCAST NETWORKS	4	3	-	1	5
		Summary:	**27**	**18**	**1**	**8**	**30**

6th Semester

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
601	R	DIGITAL SIGNAL PROCESSING	5	3	1	1	5
602	R	TELECOMMUNICATIONS SYSTEMS	5	3	2	-	5
603	R	IMAGE PROCESSING	5	3	1	1	5
604	R	SYSTEM SECURITY	5	3	1	1	5
605	GCC	LESSON FOR DEVELOPING SKILLS	-	-	-	-	-
606	GCC	GENERAL TEAM OF OPTIONAL COURSES	-	-	-	-	-
		Summary:	**20**	**12**	**5**	**3**	**20**

LESSON FOR DEVELOPPING SKILLS (TECHNICAL ECONOMIC EDUCATION)

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
1	GCC	INNOVATION & ENTERPRENEURSHIP	4	3	-	1	5
2	GCC	RESEARCH & WRITING METHODOLOGY	4	2	-	2	5
3	GCC	PROJECT MANAGEMENT	4	3	-	1	5
4	GCC	ORGANIZATION AND BUSINESS MANAGEMENT	4	3	-	1	5

GENERAL TEAM OF OPTIONAL COURSES

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
1	GTOC	MATHEMATICAL ANALYSIS II	5	4	1	-	5

SPECIALIZATION FLOWS

7th Semester
SOFTWARE COURSES FLOW

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
F1_W1F		COMPILERS	4	3	-	1	5
F1_W2F		DATABASES II	4	3	-	1	5
F1_W3F		BUSINESS INFORMATION SYSTEMS	4	3	-	1	5

F1_W4F	INTERNET APPLIANCE TECHNOLOGIES	4	3	-	1	5

FLOW OF INTELLIGENT SYSTEMS & APPLICATIONS

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
F2_W5F		DATA MINING	4	3	-	1	5
F2_W6F		GAME MAKING	4	3	-	1	5
F2_W7F		OPTIMIZATION	4	3	-	1	5

COMPUTER SYSTEM COURSES FLOW

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
F3_W8	F	INTERNET OF THINGS	4	3	-	1	5
F3_W9	F	BIOMEDICAL TECHNOLOGY	4	3	-	1	5
F3_W10F		MODELLING & SYSTEMS CONTROL	4	3	-	1	5

TELECOMMUNICATION COURSE FLOW

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
F4_W11F		ANTENNAS - MICROWAVES	4	2	-	2	5
F4_W12F		MICROWAVE INTEGRATED CIRCUITS	4	2	-	2	5
F4_W13F		OPTICAL COMMUNICATIONS - WAVES	4	3	-	1	5

NETWORK COURSE FLOW

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
F5_W14F		ADVANCED NETWORK PLANNING ISSUES	4	3	-	1	5
F5_W15F		SPECIAL NETWORK ISSUES	4	3	-	1	5
F5_W16F		e-LEARNING SYSTEMS	4	3	-	1	5

8th SEMESTER

SOFTWARE COURSES FLOW

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
F1_S1F		DEVELOPMENT OF WEB APPLICATIONS & DATA BASES	4	3	-	1	5
F1_S2F		COMUTER GRAPHICS	4	3	-	1	5
F1_S3F		MOBILE APPLIANCES PROGRAMMING	4	3	-	1	5

INTELLIGENT SYSTEMS & APPLICATIONS FLOW

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
F2_S4F		STATISTICAL MECHANICAL LEARNING	5	4	-	1	5
F2_S5F		BIOINFORMATION	4	3	-	1	5

COMPUTER SYSTEMS COURSE FLOW

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
F3_S6F		SENSOR NETWORKS	5	4	-	1	5
F3_S7F		CMOS ASIC DESIGN TECHNIQUES	4	2	-	2	5
F3_S8F		DISTRIBUTED AND PARALLEL SYSTEMS	4	3	-	1	5

TELECOMMUNICATION COURSE FLOW

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
F4_S9	F	NANOELECTRONIC DEVICES	5	2	-	2	5
F4_S10F		OPTOELECTRONICS	4	2	-	2	5

NETWORK COURSE FLOW

CODE	CAT.	LESSON	SUM.	THEOR.	COACH.	WORKS.	ECTS
F5_S11F		TELECOMMUNICATION NETWORKS	4	3	-	1	5
F5_S12F		NETWORKS ANALYSIS AND SIMULATION	4	3	-	1	5
F5_S13F		NETWORK MANAGEMENT	4	3	-	1	5

Course Outlines

A) General courses
COURSE OUTLINE Mathematical Analysis
GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Graduate			
COURSE CODE	101	SEMESTER	1	
COURSE TITLE	Mathematical Analysis			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			4	7
Exercises			1	
COURSE TYPE	general background			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/101/			

LEARNING OUTCOMES

Learning outcomes
After completing the course, student will be able to Formulate and apply the concept of a function to a contextual (real-world) situation. Demonstrate understanding of the basic concepts of the limit of a function, asymptotes and continuity. Demonstrate understanding of the meaning of derivatives and compute the derivative of algebraic, exponential and logarithmic functions of one variable. Calculate the derivatives of implicit function and parametric derivative Use derivatives to solve problems involving rates of change, tangent lines and velocity (speed), acceleration and optimization. Investigate the graph of a function with the aid of its first and second derivatives: asymptotes, continuity, tangency, monotonicity, concavity, extreme, inflection points, etc. Demonstrate understanding of the meanings of definite and indefinite integrals, fundamental theorems of calculus. Calculate integrals of polynomials, rational functions, exponential, logarithmic and trigonometric functions. Use rules of integration to calculate definite and indefinite integrals. Use integrals to solve applied problems (areas, arc length, volume, average value of a function, moments and center of mass. Examine the convergence of sequences and series of real numbers, as well as power series, Approximate functions with polynomials, Address basic issues of complex analysis Handle modern mathematical software (e.g. Matlab, Octave).
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Production of free, creative and inductive thinking Analysis and compilation of mathematical procedures and computer use

Development of critical and analytical thinking.
Appropriate level of mathematical literacy and competency.

SYLLABUS

Sets. Real numbers. Sequences of real numbers. Series of real numbers. Real Functions of a Variable. Limits and continuity of functions. Derivatives of functions. Derivative applications. Definite and indefinite integrals. Generalized integrals. Applications of Integration. Power Series. Complex numbers. Arithmetic operations. Polar forms. Powers and Roots. Functions of a complex variable: Exponential, logarithmic, trigonometric, hyperbolic functions. Contour integral. The Cauchy-Goursat theorem. Applications of the above concepts and using modern mathematical software and mathematical tools (Matlab, Octave etc).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	52 hours
Study	84 hours
Excercises	39 hours
Course total	175 hours

STUDENT PERFORMANCE EVALUATION	The final results for the course will be: - the final written test is weighting with 70% - the intermediate test with 30% Students must participate in final term exams (70%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

Thomas's Calculus, R. L. Finney, M. D. Weir, F. R. Giordano, 10th (or higher) edition, 2001, Addison-Wesley-Longman
Calculus, M. Spivak, Publish or Perish; fourth edition/2008
Ανώτερα Μαθηματικά, Αθ. Μπράτσος, Εκδόσεις Σταμούλη, 2003
Απειροστικός Λογισμός, Μιχ. Γλαμπεδάκης, Αντ. Γλαμπεδάκης, Εκδοτικός Ομιλος ΙΩΝ, 2014
Διαφορικός και Ολοκληρωτικός Λογισμός, F. Ayres, Κλειδάριθμος, 2008.
Μαθηματικά Ι, Θ. Ρασσιάς, β΄ έκδοση, Εκδόσεις Τσότρας, 2017.
Εφαρμοσμένη Ανάλυση και Στοιχεία Γραμμικής Άλγεβρας, Φιλιππάκης Μ., Έκδοση: 2η/2017, Εκδόσεις Τσότρας
Μαθηματική Ανάλυση, Brand Louis, Εκδόσεις Ι. Συμεών , 1984
A Course in Calculus and Real Analysis, Ghorpade, Sudhir R. Limaye, Balmohan V., Heal-Link/Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.
Calculus – Early Transcendentals, H. Anton, I. Bivens, S. Davis, (9th ed), John Wiley & Sons, 2009.

COURSE OUTLINE Logic Design

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	104	SEMESTER	1
COURSE TITLE	Logic Design		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		4	5
Laboratory Work		1	
COURSE TYPE	General Background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
After completing the course, student will be able to: Describe the basic principles of digital systems, Understand binary and hexadecimal numbers, Convert from one radix to another of known numbering systems, Apply Boolean Algebra to simplify Boolean expressions, Understand the operation of the standard logic gates, Design combinational logic circuits built from standard logic gates, Design and optimize combinational circuits given specific requirements, Analyze and understand the use of popular combinational circuits such as adders, subtractors, etc, Design combinational circuits using decoders and multiplexers.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Production of free, creative and inductive thinking. Team work.

SYLLABUS

Number and code representation systems: Representation of numbers and information in various numbering radices. Number radix conversion. Complements. Decimal, binary, octal, hexadecimal numbers. Arithmetic operations between binary numbers. Binary and decimal codes for numbers and characters. Binary storing and registers. Binary logic and binary codes.
Boolean algebra and logic gates: Basic definitions, axioms, and theorems of the Boolean algebra. Logic functions. Normal and standard forms. Logic operations. Elementary digital logic gates. Integrated digital circuits.
Optimization and implementation of Boolean functions, Karnaugh maps. Addition product simplification. Implementation with NAND and NOR gates. AND-OR-INVERSION implementation. NAND circuits with multiple stages. NOR circuits with multiple stages. Exclusive-OR and equivalence functions.
Combinational logic, analysis and design methods and procedure of combinational circuits, binary adders-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoder and multiplexers

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Electronic, slide-oriented, presentations uploaded to e-class, Electronic educational material available to e-class, Communication with students via e-mail.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>52 hours</td></tr><tr><td>Laboratory practice</td><td>33 hours</td></tr><tr><td>Study</td><td>40 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	The final results for the course will be: - the final written test is weighting with 70% - the intermediate test with 30% Laboratory attendance is mandatory. The "Successful / Not Successful" Assessment Criterion will apply to the lab work. The student who fail to pass the lab examination will not participate in the final examination of the course. The final and the intermediate tests should be marked at least 5/10. Successful laboratory work is valid for the next years. Intermediate test result is only valid for the current exam period. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Digital Design Mano Morris, Ciletti Michael, 6η έκδοση - 2018
Digital Electronics, Leach, Malvino, 5η έκδοση - 2006, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α, ISBN: 960-8129-16-8

- Related academic journals:

Transactions on Circuits and Systems I & II (TCAS), IEEE.
Transactions on VLSI Circuits and Systems (TVLSI), IEEE.

COURSE OUTLINE Linear Algebra

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Graduate			
COURSE CODE	102	SEMESTER	1	
COURSE TITLE	Linear Algebra			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			4	5
Exercises			1	
COURSE TYPE general background, special background, specialised general knowledge, skills development	general background			
PREREQUISITE COURSES:	None			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No			
COURSE WEBSITE (URL)				

LEARNING OUTCOMES

Learning outcomes
Linear Algebra is one of the most important branches of mathematics. The main subjects of study are linear equations and their solution, matrices, determinants as well as the study of vector spaces, linear transformations their properties and applications. Although, theoretically, Linear Algebra is defined as a self-contained branch of mathematics, however, given that it provides the basic tools for problem modelling, it constitutes a major prerequisite in various fields of applied mathematics, science, computer science, engineering, economics and administration science, etc. The course aims to familiarize students with the concepts of Linear Algebra, emphasizing the foundation of the bases necessary for future courses which depend on the knowledge of these concepts and related methods. The overall objective of the course is the effective use of these concepts in Computer Science, Telecommunications Science and in subjects related to the general area of Informatics. Upon successful completion the students should be able to: Understand what a vector is, it's difference from a scalar magnitude and execute operations between vectors. Understand the concept of matrix and perform operations between matrices or recognize if this is not feasible. Interpret the geometric nature of the solution of a system of linear equations. Understand matrix multiplication with vectors or matrices by means of linear combinations or internal products. Solve systems of linear equations with Gauss elimination and factorization into LU and compute, using these methods, the inverse of a matrix, if any. Understand and use the concepts of linear dependence and independence. Understand the meaning of the subspace of a vector space and the subspace generated by vectors. Understand the concepts of basis and dimension of a vector space. Be aware of the four basic subspaces of a matrix and in the case of small-sized matrices calculate these subspaces without using a computer. Understand and invert orthogonal matrices. Know what an orthogonal projection is and how it is calculated.

Understand the nature and the structure of a linear least squares problem as well as the technique of solving it using normal equations.
Understand eigenvalues and eigenvectors and calculate them for small-sized square matrices.
Be aware of the diagonalization of a square matrix, as well as, when and how this can be achieved.
Know what the singular value factorization and the pseudo-inverse of a matrix is, and understand their importance in the construction of the subspaces of a matrix and the reduction of dimension.
Identify a linear transformation and find its matrix.
Find the matrix for change of basis.

General Competences

The general competences that are acquired upon completion of the course are:
Production of free, creative and inductive thinking
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Developing and documenting arguments using structured mathematical thinking
Combined analysis of methods for problem solving
Decision making
Ability to deduce real world problem models

SYLLABUS

Section 1. Introduction and Overview of Basic Concepts
Vectors, linear combinations, norms and operations between vectors.
Matrices, matrix operations, properties and rules. Special forms of matrices (inverse, identity)
Applications

Section 2. Linear equations
Linear equation, it's interpretation and solution
Elimination with matrices and factorization into A = LU
Transposes and permutations
Column space and nullspace
Solving AX = 0

Section 3. Vector spaces
Vector spaces and subspaces
Solving AX=B
The nullspace of a matrix A
Rank and row reduced form
Linear independence, basis and dimension
The four fundamental subspaces

Section 4. Orthogonality
Orthogonal vectors and subspaces
Projections onto subspaces
Projection matrices and least squares
Orthonormal basis
Orthogonal matrices and Gram-Schmidt

Section 5. Determinants
Computing the determinant and the trace of a matrix
Properties of determinants
Permutations and algebraic complements
Cramer's rule, inverse and volumes

Section 6. Eigenvalues and eigenvectors
Computing eigenvalues and eigenvectors
Diagonalization and powers of a matrix
Symmetric matrices, symmetric and positive definite matrices, similar matrices
Singular Value Decomposition

Section 7. Linear transformations

Linear transformations and their matrices
Change of basis
Left and right inverse of a matrix
Pseudo-inverse

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of electronic (slide) presentations posted on the e-class platform. Use of software for demonstration purposes during lectures. Educational material is posted on the e-class platform. Students communicate with the instructor using emails and the discussion forum of the course provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	52 hours
Exercises	13 hours
Study	60 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Examinations are conducted in Greek. Final written examination with questions for developing arguments, problem solving and exercises. (70% - 100%) Non compulsory mid-term evaluation with problem solving and exercises. (up to 30%) Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

G. Strang, Γραμμική Άλγεβρα και Εφαρμογές, (μετάφραση) Παν/κές Εκδ. Κρήτης, Ηράκλειο, 2005.
G. Strang, Εισαγωγή στη Γραμμική Άλγεβρα, (μετάφραση) Εκδ. Παν/μίου Πατρών, 2006.
Γ. Δονάτος & Μ. Αδάμ, Γραμμική Άλγεβρα: Θεωρία και Εφαρμογές, Gutenberg, Αθήνα 2008.

COURSE OUTLINE «PROGRAMMING I»

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	103	SEMESTER	1
COURSE TITLE	Programming I		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	7
Laboratory Work		2	
COURSE TYPE	General Background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
The aim of the course is to familiarize students with the basic principles and concepts of programming and to acquire fundamental knowledge of the principles and constraints of programming language C. Upon completion of the course the students will: Create, compile and run a program in C. Identify the data types supported by programming language C. declare variables and assign values. Read data from the keyboard and displays them on the screen using the scanf () and printf () library functions, respectively. Write commands to C using arithmetic operators, relational operators, logical operators, bitwise operators, assignment operators, and misc operators. Control the flow of a program using the if-else and switch commands or using the triad operator. Create and execute loops using the for, while and do-while commands. Declare and implement functions and use the most popular ready functions from its libraries. Distinguish the function call by using a value from a referenced function call and can implement and use such functions. Handle the given char type and create and use alphanumeric. Create and use one-dimensional and two-dimensional arrays.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to Programming & Language C Data Types – Declaring Variables - Data Output. Data input. Operators. Program Controls.

Loops
Functions.
Characters.
Arrays.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of electronic presentations posted in e-class. Using software on the computer during the lecture. Use of specialized software. Provision of educational material through e-class. Managing work / exercises through a website. Communicating with students via e-mail. Electronic chat room for lecturers and students.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory practice</td><td>60 hours</td></tr><tr><td>Study</td><td>71 hours</td></tr><tr><td>Course total</td><td>175 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	Written examination at the end of the semester and delivery of laboratory exercises (every week or every second week), which will contribute 10% -20% to the final score. Optional assignments may also be given to contribute 10% - 20% to the final grade and / or a mid-term written test (progress) that will also contribute 10% -20% to the final score. For all the above, there will be corresponding material posted on the course website, with many similar examples of equally difficult, for each learning unit, as well as indicative examples of written work and laboratory exercises. The evaluation criteria are communicated to the students in the first lecture, which are explicitly mentioned in the syllabus of the course, which is also available in the e-class

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Γ. Τσελίκης, Ν. Τσελίκας, 2012, C από την θεωρία στην Εφαρμογή, 2η Έκδοση.
Δ. Καρολίδης,2013, C, έκδοση ιδίου.
H. Cheng, C για Επιστήμονες και Μηχανικούς, 2012, 1η Έκδοση, Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε.
P. Deitel, H. Deitel, 2014, Οδηγός της C για Προγραμματιστές, 1η Εκδ. Εκδότης: Χ. Γκιούρδα & ΣΙΑ ΕΕ
Ν. Μ. Χατζηγιαννάκης, Η Γλώσσα C σε Βάθος, 2012, Έκδ.4η, Εκδόσεις Κλειδάριθμος ΕΠΕ
C. Sedgewick, Algorithms in C, 1998, Addison-Wesley
Kernighan, Ritchie, 1988, The C Programming Language, 2nd Edition, Prentice Hall
S. Prata, C Primer Plus (Developer's Library), 2013, 6th Edition, Addison-Wesley Professional
Y.H. Lu, 2015, Intermediate C Programming, CRC Press
C Style and Coding Standards, http://www.chrisott.org/resources/cstyle/ indhillcstyle.pdf

COURSE OUTLINE «ELECTRONICS»

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	105	SEMESTER	1
COURSE TITLE	Electronics		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	6
Laboratory Work	2	

COURSE TYPE	General Background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
After successful completion of the course, the students will be able to: Identify the unique vocabulary associated with electronics and explain the basic concepts of Semiconductor diodes such as pn junction diode, characteristics and ammeters, DC loadline, Zener diode. To apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers. To solve examples on rectifiers for parameters such as Capacitance, load and source effect, line and load regulations, and circuit current. Draw and explain the structure of bipolar junction transistor. Explain the operation of each device in terms of junction bias voltage and charge carrier movement. Identify and explain the various current components in a transistor. Describe the application of transistors for Current and voltage amplification. Also to describe the characteristics of different configurations of the transistor. Describe DC load line and bias point. List, explain, and design and analyze the different biasing circuits. Sketch, explain and design the amplifier circuit for given specification and analyze them discuss oscillator principles, oscillator types, and frequency stability as it relates to its operation. Analyze and Design the different types of Oscillators. Discuss ideal and practical operational amplifier (op amp) their electrical parameters, need for op amp. Explain and design different application circuits using op amp. Sketch and explain the basic block of communication system. State the principles of modulation and explain the different modulation techniques. Describe the theory and operation of radio systems and superheterodyne receivers. Solve simple examples. List and explain the different number system. Solve examples on converting one form of number system to another form. State Boolean laws and theorems. State and explain the different logic gates using truth table. Analyze and design different adder circuits.
General Competences
Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

The Electronics course introduces students to the concepts and elements of Electronic Circuits. It deals with combinational circuits with resistors, capacitors and coils (frequency filters). The course guides the student in the thorough research and explanation of microscopic phenomena, the structural components of analog electronics (semiconductors, PN contacts, diodes, etc.). The main purpose is to understand phenomena, physical quantities and units, experimental processes, and all

the basic principles that continue to govern modern electronic technologies. The course deepens the electronic circuits by analyzing their basic methods of solving them (design and mathematical calculation of the physical quantities and units of the circuit). It also impedes the use of semiconductor elements, and their basic applications. Diodes, Zener diodes, photodiodes and other elements that are widely used as voltage stabilizers, rectifiers, analogue signal multipliers, but also in the first digital circuits. The course then examines the Bipolar Junction Transistor (BJT) electrical characteristics and polarization circuits, with an emphasis on amplifying analog signals. As opposed to bipolar transistors, the field effect transistors are introduced, and the perspectives given to computer science and digital technology for their exceptional properties. Finally, it deals with circuits and applications of differential and power amplifiers.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of electronic presentations posted in e-class. Provide educational material through e-class. Managing work / exercises through a website. Communicating with students via e-mail. Electronic chat room for lecturers and students.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory practice</td><td>26 hours</td></tr><tr><td>Project Writing</td><td>20 hours</td></tr><tr><td>Non-directed Study</td><td>88 hours</td></tr><tr><td>Course total</td><td>150 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	Assessment of the course will result from the combination of their performance: In two intermediate tests that will be conducted during the semester, which will include multiple choice tests and problem solving (20/100). Written projects containing the analysis of the laboratory exercises (20/100) The final examination of the course, which will include problem-solving exercises (60/100). To solve the problems, we will evaluate the correct method of solving (50/100), the understanding of the functions (30/100), the correct numerical solution and the extraction of results (20/100). For all the above, there will be corresponding material posted on the course website, with many similar examples of equally difficult, for each learning module, as well as indicative examples of written assignments and laboratory exercises.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Ηλεκτρονική, A. P. Malvino, Bates D. Εκδόσεις Τζιόλα, 8η Έκδοση,
Ηλεκτρονικά, Χαριτάντης Ι, Εκδόσεις Αράκυνθος,
Εφαρμοσμένα Ηλεκτρονικά, Schuler, Εκδόσεις Τζιόλα.
Basic Circuit Theory, Charles A. Desoer, Ernest S. Kuh, McGraw Hill.
Linear System Theory and Design, Chi-Tsong Chen, Oxford Series in Electrical and Computer Engineering, 1998.
Αναλογικά ηλεκτρονικά Συγγραφέας Meade Russell L., Ίων c1999
Γενικά ηλεκτρονικά αρχές ηλεκτρονικής τεχνολογίας, Haberle, Gregor (F.Writ.), 5η έκδ., Ευρωπαϊκές Τεχνολογικές Εκδόσεις, 1994
Handbook of advanced electronic and photonic materials and devices, Nalwa Hari Singh 1954-, San Diego, CA Academic Press 2001
- Related academic journals:
IEEE transactions on communication and electronics, IEEE.
Advances in electronics and electron physics.

International journal of electronics

COURSE OUTLINE Principles of Electromagnetism and Telecommunications

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	201	SEMESTER	2
COURSE TITLE	Principles of Electromagnetism & Telecommunications		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		4	6
Laboratory Work		1	
COURSE TYPE	General background, General knowledge, Skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Verification of the feasibility of an electromagnetic field Electric and magnetic field calculation from simple charge and current distributions. Charge and current distribution calculation when the electromagnetic field is given. Interface conditions problem solving Analysis of time-varying electromagnetic problems both with phasor complex numbers and in the time field Calculation of electromagnetic energy and field strength
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

Fundamental principles of electromagnetism, Maxwell's equations (integral, point and interface conditions). Constitutional equations. Charge distributions, current distributions, principle of charge conservation. Elecrto-static field. Magneto-static field. Wave equation. Harmonic fields. Phasor complex numbers. Electromagnetic potentials. Plane waves. Electromagnetic energy and power (Poynting vector, law of electromagnetic energy conservation). Wave polarization. Reflection and refraction of plane waves. Stationary waves. Elextromagnetic spectrum. Introduction to the transmission lines.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.

TEACHING METHODS	

Activity	Semester workload
Lectures	52 hours
Laboratory practice	13 hours
Study and analysis of bibliography	16 hours
Essay writing	16 hours
Study	53 hours
Course total	150 hours

STUDENT PERFORMANCE EVALUATION	The final score for the course will be 60% from the final written exams and 40% from the midterm exams in the middle of the semester. For succeeding the exams, the score of the written exams should be at least 50/100. The midterm score is valid only for the current exams period. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Ι. Τσαλαμέγκας, Ι. Ρουμελιώτης, Ηλεκτρομαγνητικά πεδία, τόμος Α΄, 1η έκδοση, Τζιόλα, 2010. Κωδικός
στον Εύδοξο: 18549115.
2. Ι. Βομβορίδης, Ηλεκτρομαγνητικά πεδία Μέρος Α΄, 1η έκδοση, Συμεών, 2009. Κωδικός στον Εύδοξο: 50659261.
3. Σημειώσεις του διδάσκοντα.

COURSE OUTLINE Network Protocols and Architecture

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	202	SEMESTER	2
COURSE TITLE	Network Protocols and Architecture		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	4	6
Laboratory work	1	

COURSE TYPE	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://www.dit.uoi.gr/e-class/courses/120/

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understand how protocols and standards benefit a global internetwork. Become familiar with the role of protocols at every level of TCP/IP suite Understand the individual protocols and technologies (e.g. IPv4, IPv6, TCP, UDP, ICMP, ARP, etc.), as well as web applications (for example: mail service , web service , ftp service, etc.) to understand IPv4 and IPv6 addressing and the role subnet masks. to be able to design hierarchical sub-networks to be able to identify the header information of various packets that are used in TCP/IP suite to be aware of the problem of congestion in internet as well as to know the relevant algorithms that are used to avoid this phenomenon to be able to create integrated applications with html and CSS language
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary networking technology Adapting to new situations Decision-making Working independently Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to networks (Internet structure, backbone networks and access networks). Network traffic and characteristics of network traffic (delay, packet loss and throughput). Layered: TCP/IP and OSI model.
Medium Access sub-layer: MAC address, Access technologies. Data Link sub-layer: Methods for bit Error detection and correction.
Internet layer: IPv4 addresses, IPv4 classes, IP datagram structure (header fields)
Protocols: ARP, RARP, ICMP and IGMP. NAT addresses. CIDR addressing. IPv6 addresses. Design hierarchical sub-networks on demand.

Transport layer: Analysis of TCP Protocol, flow control methods, recognizing fields of TCP's segment. Network congestion and algorithms to address this phenomenon (e.g. Tacho, Reno). UDP protocol.
Application layer: Basic applications such as: Web service, FTP service, Name service, and DHCP. Purpose, structure, type and examples of network Sockets.
Practical training: Project with HTML, CSS, Dynamic HTML or JavaScript language and configure router, implementing subnets.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS	Use course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and undertake to carry out project. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>52 hours</td></tr><tr><td>Study</td><td>70 hours</td></tr><tr><td>Laboratory Working</td><td>13 hours</td></tr><tr><td>Project</td><td>15 hours</td></tr><tr><td>Course total</td><td>150 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other Specifically-defined evaluation criteria are given, and if and where they are accessible to students.	The final results for the course will be: - the final written test is weighting with 70% - the laboratory working is weighting with 15%, and - the project is rated with a factor of 15%. Laboratory attendance is mandatory and all students are required to submit the final project. Students must attend laboratories (maximum of 2 absences allowed). Students that have attended the laboratory at previous years can alternatively be examined on final exams. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
F. Kurose, K.W. Ross, Δικτύωση Υπολογιστών, 6η έκδοση, Γκιούρδα, 2013. Κωδικός στον Εύδοξο: 33094885.
D. Comer, Δίκτυα και Διαδίκτυα Υπολογιστών και εφαρμογές του στο Internet, 4η έκδοση, Κλειδάριθμος, 2007. Κωδικός στον Εύδοξο: 13651.
A. Tanenbaum, D. Wetherall, Δίκτυα Υπολογιστών, 5η έκδοση, Κλειδάριθμος, 2011. Κωδικός στον Εύδοξο: 12534026.
TCP/IP, Andrew G. Blank, M. Γκιούρδας
Advanced Internet Technologies, U. Black, Prentice Hall, 1998.
- Related academic journals:
https://www.ietf.org/standards/
http://ipj.dreamhosters.com/
https://www.mdpi.com/journal/futureinternet

COURSE OUTLINE Discrete Mathematics

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	203	SEMESTER	3
COURSE TITLE	Discrete Mathematics		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		4	6
Exercises		1	
COURSE TYPE	general background		
PREREQUISITE COURSES:	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
Discrete Mathematics is devoted to the study of mathematical structures that are fundamentally discrete rather than continuous. The subjects studied in discrete mathematics (integers, graphs, logical propositions, etc.) do not change smoothly, such as real numbers, but have separate, distinct values. Consequently, discrete mathematics excludes issues of "continuous mathematics," such as calculus and mathematical analysis. The concepts and mathematical symbolism of discrete mathematics serve to study and describe objects and problems of various branches of computer science, such as computational algorithms, programming languages, cryptography, automated theorem proving and software development. Upon successful completion the students should be able to: Understand the basic discrete structures, their properties and their relation to other subjects as well as their application to real world problems. Know and apply correct techniques for proving logical propositions. Convert simple sentences of natural language into types of propositional logic and understand the inadequacy of propositional logic for formulating more complex sentences of natural language. Use basic counting rules (e.g., product, sum, layouts, shifts, options with / without repeat, etc.) to derive combinational formulas. Understand the fundamental notions of probabilities and calculate the (unconditional / conditional) probability that an event occurs in a discrete sample space. Identify equivalence relations and/or order relations, as well as classes, extremes and bounds. Identify graph structures and apply basic algorithms (connectivity, Euler and Hamilton circuits, spanning trees, etc.) Identify and demonstrate basic graph properties (e.g., isomorphic graphs, Euler traces and circuits, planar graphs, etc.). Apply different traversal methods for graphs and/or trees (pre-order, in-order and post-order, BFS, DFS, etc.). Be able to model real world problems for computer processing, using the appropriate type of graphs or trees, such as representation of a network topology, organization of a hierarchical file system (e.g. Linux), etc. Understand the structure and the use of finite state machines for information processing. Understand the concept of computation of a formal language. Understand the relation between finite automata and regular languages.

General Competences
The general competences that are acquired upon completion of the course are: Production of free, creative and inductive thinking Search for, analysis and synthesis of data and information, with the use of the necessary technology Developing and documenting arguments using structured mathematical thinking Combined analysis of methods for problem solving Development of algorithmic thinking Ability to deduce real world problem models

SYLLABUS

Section 1. Sets and set operations. Elements of propositional logic. Inclusion-exclusion principle. Principles of proof. Section 2. Permutations and combinations. Elements of discrete probability. Section 3. Relations and functions. Order relations. Equivalence relations. Lattices. Applications. Section 4. Graphs. Definitions, properties and basic problems. Connectivity and related concepts. Basic algorithms on graphs and applications. Planar graphs, Euler's formula and Kuratowski's theorem. Trees. Definitions, properties, algorithms and applications. Section 5. Languages, Computations and Finite Automata Formal languages and computability. Finite state automata. Regular languages, regular expressions, and Deterministic finite automata.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of electronic (slide) presentations posted on the e-class platform. Use of software for demonstration purposes during lectures. Educational material is posted on the e-class platform. Students communicate with the instructor using emails and the discussion forum of the course provided by the e-class platform.
TEACHING METHODS The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc. The student's study hours for each learning activity are given as well as the hours of non-directed study	

Activity	Semester workload
Lectures	52 hours
Exercises	13 hours
Study	85 hours
Course total	150 hours

according to the principles of the ECTS	
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other Specifically-defined evaluation criteria are given, and if and where they are accessible to students.	Examinations are conducted in Greek. Final written examination with questions for developing arguments, problem solving and exercises. (70% - 100%) Non compulsory mid-term evaluation with problem solving and exercises. (up to 30%) Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

C.L. Liu. Στοιχεία Διακριτών Μαθηματικών. Πανεπιστημιακές Εκδόσεις Κρήτης, 1999.
Kenneth H. Rosen. Διακριτά Μαθηματικά και εφαρμογές. Εκδόσεις Τζιόλα, 2014.
Susanna S. Epp. Διακριτά Μαθηματικά με εφαρμογές. Εκδόσεις Κλειδάριθμος, 2010.

- Related academic journals:

Discrete Applied Mathematics: The Journal of Combinatorial Algorithms, Informatics and Computational Sciences, ELSEVIER.
SIAM Journal on Discrete Mathematics (SIDMA), SIAM.
Random Structures & Algorithms, Wiley Periodicals, Inc.

COURSE OUTLINE Programming II

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	204	SEMESTER	2
COURSE TITLE	Programming II		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	7
Laboratory Work		2	
COURSE TYPE	special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://www.dit.uoi.gr/e-class/courses/114/		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding of programming techniques. Undestanding of the main principles of modular programming. Familiarization with arrays of one and two dimensions. Undestanding ofthe main principles of abstract structures.

Familiarization with file handling.
General Competences

The general competences that are acquired upon completion of the course are:
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Project planning and management
Criticism and self-criticism
Production of free, creative and inductive thinking

SYLLABUS

Functions without arguments, functions with arguments, vectors, arrays, strings, pointers to variables, pointers and arrays, dynamic allocation of memory, text files, random access files, introduction to object oriented programming.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory projects</td><td>26 hours</td></tr><tr><td>Study</td><td>110 hours</td></tr><tr><td>Course total</td><td>175 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	Students must complete four p programming projects during the semester (30%). Students must participate in final term exams (60%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

Πλήρες εγχειρίδιο της C++, πέμπτη έκδοση, Jesse Liberty, Bradley L. Jones, Γκιούρδας Μ., 2006, ISBN: 9605123185

Αρχές Προγραμματισμού με C++, Δ. Αποστόλου, Ι.Χ. Παναγιωτόπουλος, Εκδόσεις Βαρβαρήγου, 2018, ISBN: 978-960-7996-74-9

Εισαγωγή στον Προγραμματισμό με την C, Νικόλαος Μισυρλής, Εθνικό και Καποδιστριακό Πανεπιστημίου Αθηνών, 2007, ISBN: 960-92031-0-8.

Προγραμματισμός με τη C++, 2η Έκδοση, Stroustrup Bjarne, Εκδόσεις Παπασωτηρίου, 2018, ISBN 978-960-491-114-1.

Αρχές Προγραμματισμού με C/C++, Ιωάννης Χρήστος Παναγιωτόπουλος, Δημήτριος Αποστόλου, Εκδόσεις Βαρβαρήγου, 2012, ISBN 978-960-93-4248-3.

COURSE OUTLINE Digital Electronics

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	205	SEMESTER	2
COURSE TITLE	Digital Electronics		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		2	
COURSE TYPE	General Background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
After completing the course, student will be able to: Understand the principles of digital systems with clock, Analyze complex digital systems that incorporate memory elements, Combine memory and logic elements in order to create complex digital systems, Implement digital systems on breadboard, Analyze and design synchronous sequential circuits, Understand Finite State Machine models, Understand the operation of basic sequential subsystems, such as registers and counters, Design basic sequential subsystems, such as the aforementioned ones, Understand the memory technology and related error correcting schemes, Understand the operation of the programmable logic, Understand the basic principles of the Register Transfer Level (RTL) design methodology, Understand the basic principles of the algorithmic state machines (ASM) and diagrams.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Production of free, creative and inductive thinking, Team work.

SYLLABUS

Sequencial circuits, analysis of clocked sequential circuits, state reduction and assignment, design procedure, registers, shift registers, ripple counters, synchronous counters, memory and programmable logic, memory decoding, error detection and correction, programmable logic array and programmable array logic, register transfer level designing.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Electronic, slide-oriented, presentations uploaded to e-class, Electronic educational material available to e-class, Communication with students via e-mail.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory practice	26 hours
Non-directed study	60 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	The final results for the course will be: - the final written test is weighting with 70% - the intermediate test with 30% Laboratory attendance is mandatory. The "Successful / Not Successful" Assessment Criterion will apply to the lab work. All students are required to deliver 3 papers, which are evaluated again with the "successful / unsuccessful" criterion. If a paper is characterized unsuccessful, the student is obliged to resume work and re-evaluate. The student who fails to pass the lab examination will not participate in the final examination of the course. The final and the intermediate tests should be marked at least 5/10. Successful laboratory work is valid for the next years. Intermediate test result is only valid for the current exam period. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Digital Design Mano Morris, Ciletti Michael, 6η έκδοση - 2018
Digital Electronics, Leach, Malvino, 5η έκδοση - 2006, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α, ISBN: 960-8129-16-8

- Related academic journals:
Transactions on Circuits and Systems I & II (TCAS), IEEE.
Transactions on VLSI Circuits and Systems (TVLSI), IEEE.

COURSE OUTLINE Computer Architecture

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	301	SEMESTER	3
COURSE TITLE	Computer Architecture		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	6
Laboratory work		2	
COURSE TYPE	General Background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
After completing the course, student will be able to: Recognize the basic blocks of a computer design, Understand the different levels of memory hierarchy, their organization and the policies used for their management, Analyze bus arbitration policies, Understand the organization of a microprocessor and a pipeline structure, Describe the characteristics of CISC and RISC architectures, Analyze addressing modes, Understand the functionality and structure of a CPU, Describe the operation of the CPU's control unit, Develop assembly - based programs.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Production of free, creative and inductive thinking, Team work.

SYLLABUS

Short history of computers and microprocessors. Instruction Set Architecture. Fundamental computer structure. Main memory organization and technology. Secondary memory organization and technology. Cache architecture and operation. Branch prediction. Common I/O devices and principles of operation. Buses and arbitration. Microprocessor organization and technology. CPU architecture, data path and control unit design. Microprogramming. Assembly programming. Pipelining, superscalar processors. Instruction formats and encoding. Addressing. Virtual memory.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Electronic, slide-oriented, presentations uploaded to e-class, Electronic educational material available to e-class, Communication with students via e-mail.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory practice	26 hours
Essay writing	20 hours

	Study	65 hours
	Course total	150 hours
STUDENT PERFORMANCE EVALUATION	The final results for the course will be: - the final written test is weighting with 50% - the intermediate test with 20% - laboratory with 30% Laboratory attendance is mandatory. All students are required to deliver 3 essayes, the first two are evaluated with the "successful / unsuccessful" criterion. If an essay is characterized unsuccessful, the student will not participate in the final examination of the course. The final result for the laboratory will be 40% of the progress and 60% of the grade of the third essay. The final and the intermediate tests should be marked at least 5/10. Successful laboratory work is valid for the next years. Intermediate test result is only valid for the current exam period. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Computer Architecture and Organization, Stallings William, 10th Edition 2016, TZIOLLAS inc.,
Computer Architecture: A Quantitative Approach, John L. Hennessy and David A. Patterson, 5th Edition - 2012, Elsevier Inc., ISBN: 978-0-12-383872-8
- Related academic journals:
IEEE Computer Architecture Letters

COURSE OUTLINE Object Oriented Programming

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	302	SEMESTER	3
COURSE TITLE	Object Oriented Programming		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		4	7
Laboratory work		1	
COURSE TYPE	special background		
PREREQUISITE COURSES:	Suggested courses: Programming I, Programming II		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/110/		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: In depth understanding of the object oriented programming paradigm and its advantages over procedural programming. Understanding of object oriented terminology (i.e. information hiding, polymorphism, inheritance, polymorphic hierarchies, encapsulation). Acquisition of practical knowledge that can be applied in effective programming using an Object Oriented language (e.g. C++14, Java, C#, …). Use of popular libraries (e.g. STL, Boost). Familiarization with Object Oriented good practices. Introduction to the basic principles of Object Oriented Design using UML. Introduction to Design Patterns and implementation of selected design patterns.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to Object Oriented Programming, basic concepts: information hiding, encapsulation, inheritance, polymorphism. Review of C (pointers, structs, memory allocation - deallocation). Object oriented programming using C++. Classes, objects. Overloading. Constructors, destructors. Operator overloading. Inheritance, polymorphic hierarchies, multiple inheritance. Exceptions, exception handling. Template programming. The STL library. Other libraries (e.g. Boost). Object oriented programming in other languages (Java, Python, etc.). Basic principles of Object Oriented Design (loose coupling, dependency inversion, etc.). Object oriented design using UML. Introduction to design patterns.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY .	Face-to-face

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	52 hours
Study	60 hours
Laboratory programming tutorials	13 hours
Programming exercises	25 hours
Project	25 hours
Course total	150 hours

STUDENT PERFORMANCE EVALUATION	Students must attend laboratories (maximum of 2 absences allowed). Three sets of exercises must be delivered and graded (20%). Students that have attended the laboratory at previous years can alternatively be examined on midterm exams. Students must complete a programming project accompanied with a technical report (30%). Students must participate in final term exams (50%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Η γλώσσα προγραμματισμού C++, Bjarne Stroustrup, 4η έκδοση – 2014, Εκδόσεις Κλειδάριθμος, ISBN : 978-960-332-209-2

C++ προγραμματισμός, Paul Deitel, Harvey Deitel, 9η έκδοση – 2014, Εκδόσεις Μ. Γκιούρδας, ISBN: 978-960-512-680-3

Προγραμματισμός με τη C++, Bjarne Stroustrup, 2η έκδοση – 2018, Εκδόσεις Παπασωτηρίου, ISBN: 978-960-491-114-1

Πλήρης C++, Walter Savitch, 4η έκδοση – 2011, Εκδόσεις Τζιόλας, ISBN: 978-960-418-358-6

Η γλώσσα C++ σε βάθος, Νίκος Μ. Χατζηγιαννάκης, 2η έκδοση - 2014, Εκδόσεις Κλειδάριθμος, ISBN: 978-960-461-620-6

C++ για μηχανικούς, Edward Scheinerman, 2010, Εκδόσεις Κλειδάριθμος, ISBN: 978-960-461-322-9.

Αντικειμενοστρεφής σχεδίαση UML. Αρχές, πρότυπα και ευρετικοί κανόνες, Αλέξανδρος Ν. Χατζηγεωργίου, 2005, Εκδόσεις Κλειδάριθμος, ISBN: 960-209-882-1

A tour of C++, Bjarne Stroustrup, 2nd edition – 2018, Addison-Wesley Professional, ISBN: 978-0134997834

Clean C++: Sustainable Software Development Patterns and Best Practices with C++ 17, Stephan Roth, 1st edition – 2017, Apress, ISBN: 978-1484227923

Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14, Scott Meyers, 1st edition – 2014, O' Reilly Media, ISBN: 978-1491903995

- Related academic journals:

IEEE Transactions on Software Engineering

ACM Transactions on Software Engineering and Methodology

Proceedings of the Conference on Object-Oriented Programming Systems, Languages, and Applications, OOPSLA

COURSE OUTLINE «SIGNALS & SYSTEMS»

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	303	SEMESTER	3
COURSE TITLE	Signals & Systems		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	4	6
Exercises	1	

COURSE TYPE	General Background, specialized General Knowledge, Skills Development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
At the end of this course, students should: Understand the basic concepts for continuous-time and discrete-time signals and systems. Understand linear time-invariant systems and their characterization using impulse response. Be able to compute the output of a continuous-time or discrete-time linear time-invariant system using convolution in the integral or sum form. Understand Fourier series for the analysis and representation of periodic continuous-time signals. Understand the representation of signals using a countably infinite orthogonal basis. Understand the actual meaning of the Fourier series and its infinite sum. Be able to develop the continuous-time Fourier transform from the Fourier series and understand related topics such as time scaling, convolution theorem, Parseval's relation, uncertainty principle and eigenfunctions of the Fourier operator. Understand the discrete-time Fourier transform and its properties. Understand the Laplace transform and concepts such as the region of convergence
General Competences
Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

Introduction Classification of signals Dirac delta Upsampling and downsampling in discrete-time systems Classification of systems Linear time-invariant systems Continuous-time and discrete-time convolution Fourier series Fourier series: advanced topics Continuous-time Fourier transform and its properties Uncertainty principle Eigenfunctions of Fourier transform Discrete-time Fourier transform Properties of discrete-time Fourier transform Two-sided Laplace transform One-sided Laplace transform Z transform

Review

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of electronic presentations posted in e-class. Provide educational material through e-class. Managing work / exercises through a website. Electronic communication of instructors and students, through the course webpage and by e-mail.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Assessment of the course will result from the combination of their performance: In two intermediate tests that will be conducted during the semester, which will include multiple choice tests and problem solving (20/100). Written projects containing the analysis of the laboratory exercises (20/100) The final examination of the course, which will include problem-solving exercises (60/100). To solve the problems, we will evaluate the correct method of solving (50/100), the understanding of the functions (30/100), the correct numerical solution and the extraction of results (20/100). For all the above, there will be corresponding material posted on the course website, with many similar examples of equally difficult, for each learning module, as well as indicative examples of written assignments and laboratory exercises.

Activity	Semester workload
Lectures	52 hours
Study for Lectures	13 hours
Project writing	20 hours
Study	65 hours
Course total	150 hours

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Θεοδωρίδης Σέργιος, Μπερμπερίδης Κώστας, Κοφίδης Λευτέρης, Εισαγωγή στη θεωρία σημάτων και συστημάτων, Γ. ΔΑΡΔΑΝΟΣ - Κ. ΔΑΡΔΑΝΟΣ, 2003.
Oppenheim, Willsky, Nawab, ΣΗΜΑΤΑ ΚΑΙ ΣΥΣΤΗΜΑΤΑ, ΓΡΗΓΟΡΙΟΣ ΧΡΥΣΟΣΤΟΜΟΥ ΦΟΥΝΤΑΣ, 2011.
Θεόδωρος Αλεξόπουλος, ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΑΝΑΛΥΣΗ ΣΗΜΑΤΟΣ, Πανεπιστημιακές, Εκδόσεις ΕΜΠ, 2011.

- Related academic journals:

IEEE transactions on Signal Processing, IEEE.
IEEE Journal on Selected Topics in Signal Processing
IEEE Signal Processing Magazine
Signal Processing, Elsevier

COURSE OUTLINE Signal propagation

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	405	SEMESTER	3
COURSE TITLE	Signal propagation		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	4	5

Laboratory work		1	
COURSE TYPE	General background, general knowledge, Skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Analysis of basic for prediction of transmission Calculation of transmission range Problem-solving for transmission. Reflection and refraction of plane waves Analysis of the characteristics observed in the transmission channels Calculation of transmission prediction in specified locations
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

Fundamental principles of cellular communications. Prediction of propagation. Characteristics observed in the transmission channels. Propagation, reflection and refraction of plane waves. Antennas and radiation. Diffraction by edges and corners. Wave propagation over plane ground with buildings. Shadow fading, terrain and trees morphology effect. Prediction of propagation in specific locations.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	52 hours
Laboratory practice	13 hours
Non-directed study	60 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	The final score for the course will be 60% from the final written exams and 40% from the midterm exams in the middle of the semester. For succeeding the exams, the score of the written exams should be at least 50/100. The midterm score is valid only for the current exams period.

	Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Bertoni, Henry L. Διάδοση ραδιοκυμάτων στα συστήματα ασύρματης επικοινωνίας / Henry L. Bertoni · μετάφραση Μαρία Φραγκάκη. - 1η έκδ. - Αθήνα: Κλειδάριθμος, 2008.
2. Σημειώσεις του διδάσκοντα.

COURSE OUTLINE Data Structures

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	305	SEMESTER	3	
COURSE TITLE	Data Structures			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			4	6
Laboratory work			1	
COURSE TYPE	special background			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No			
COURSE WEBSITE (URL)				

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding and usage of main data structures, their principles and concepts. Students be able to describe the operation and implementation of main data structures Students will be able to compare among them the data structures, evaluate data structure performance and choose the most appropriate data structure
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to the main issues of algorithmic complexity and algorithmic comparison. Design data structures for representing information in computer memory, Abstract data types and their implementation. Lists, stacks, Queues, priority queues, dictionaries, sorting, recursion, Trees, Binary Trees, AVL, Black-Read trees, (A,b) Trees, Heaps, Huffman algorithms, Sorting, Hashing,

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY .	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year.

	Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Students must complete some programming projects accompanied with a technical report for each lab (20%). Students must participate in mid-term exams (20%). Students must participate in final term exams (60%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

Activity	Semester workload
Lectures	52 hours
Laboratory work	13 hours
Laboratory projects	20 hours
Study	65 hours
Course total	150 hours

ATTACHED BIBLIOGRAPHY

Δομές δεδομένων, αλγόριθμοι και εφαρμογές C++, S. Sahni, 1η έκδοση, Τζιόλα, 2004. Κωδικός στον Εύδοξο: 18548971.

Δομές Δεδομένων, Π. Μποζάνης, 2η έκδοση, Εκδόσεις Τζιόλα, 2017, ISBN 9789604185948

Δομές Δεδομένων, Έννοιες, Τεχνικές και Αλγόριθμοι. Γ.Φ. Γεωργακόπουλος Πανεπιστημιακές Εκδόσεις Κρήτη 2011

Δομές Δεδομένων & Αλγόριθμοι σε JAVA, Michael T. Goodrich, Roberto Tamassia:Εκδόσεις Δίαυλος, 2013

Δομές Δεδομένων και Αλγόριθμοι με Αντικειμενοστραφή Σχεδιαστικά Μορφήματα στη C++. Bruno Preiss, ISBN 9789605466923, Πεδίο Εκδοτική (2016) Κωδικός στον Εύδοξο 50658958

Αλγόριθμοι και Δομές Δεδομένων: Τα βασικά Εργαλεία. K.Mehlhon P. Sanders, ISBN 9789604614547 Κλειδάριθμος (2014)

Δομές Δεδομένων & Αλγόριθμοι στη JAVA, Michael R. Lafore :Εκδόσεις Γκιούρδας ISBN 9605124521

Αλγόριθμοι: Σύγχρονες Προσεγγίσεις. J. Edmonds ISBN 9789605860431, Εκδόσεις Κριτική 2016

COURSE OUTLINE Principles of Programming Languages

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	401	SEMESTER	4
COURSE TITLE	Principles of Programming Languages		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		4	6
Laboratory work		1	
COURSE TYPE	special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/238/		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Ability to express ideas through broad knowledge of programming languages characteristics. Understanding of basic programming paradigms (imperative programming, object oriented programming, generic programming, functional programming, logic programming). Ability to learn new programming languages. Ability to select the most appropriate programming language per application. Better usage of programming languages. Understanding the importance of implementation. Understanding of the evolution of programming languages.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Evolution of the most important programming languages. Syntax and semantics. Lexical and syntactical analysis. Names, binding, scopes. Data types. Expressions, assignments. Subprograms. Abstract types and encapsulation structures. Object oriented programming. Generic programming. Concurrency. Exceptions, exception handling. Alternative programming models. Functional programming languages (e.g. Haskell). Logic programming languages (e.g. Prolog). Scripting languages (e.g. Python).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory	Use of the course's webpage that keeps educational material of previous academic years which is updated every year.

<table>
<tr><td>education, communication with students</td><td>Lectures typically use electronic presentations, writing, executing and criticizing segments of code.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td><table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>52 hours</td></tr><tr><td>Study</td><td>60 hours</td></tr><tr><td>Laboratory programming tutorials</td><td>13 hours</td></tr><tr><td>Programming exercises</td><td>25 hours</td></tr><tr><td>Course total</td><td>150 hours</td></tr></table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>Students must attend laboratories (maximum of 2 absences allowed). Four sets of exercises (in functional and logic programming) must be delivered and graded (30%).
Students that have attended the laboratory at previous years can alternatively be examined on midterm exams.
Students must participate in final term exams (70%).
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Αρχές γλωσσών προγραμματισμού, Robert W. Sebesta, 11η έκδοση – 2016, Εκδόσεις Μ. Γκιούρδας, ISBN: 978-0-13-394302-3
Πραγματολογία των γλωσσών προγραμματισμού, Michael L. Scott, 2η έκδοση – 2009, Εκδόσεις Κλειδάριθμος, ISBN: 978-960-461-230-7
Σύγχρονες γλώσσες προγραμματισμού – μια πρακτική εισαγωγή, Adam Brooks Webber, 2005, Πανεπιστημιακές Εκδόσεις Κρήτης, ISBN: 978-960-524-282-4
Theoretical Introduction to Programming, Bruce Ian Mills, 2006, Springer, ISBN-13: 978-1846280214
Concepts, Techniques, and Models of Computer Programming, Peter Van Roy, Seif Haridi, 2004, The MIT Press, ISBN-13: 978-0262220699
Concepts of Programming Languages: A Unified Approach, Karl Abrahamson, 2011, http://www.cs.ecu.edu/~karl/3675/fall11/book.pdf
- Related academic journals:
ACM Transactions on Programming Languages and Systems
ACM SIGPLAN Principles of Programming Languages (annual conference)

COURSE OUTLINE Operating Systems

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	402	SEMESTER	4
COURSE TITLE	Operating Systems		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures and		3	7
Laboratory work		2	
COURSE TYPE	special background		
PREREQUISITE COURSES:	Suggested courses: Computer Architecture, Data Structures		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	English		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding of the structure and functionality of an operating system Understanding of basic concepts such as process, thread, process synchronization and communication, deadlocks, memory management policies, virtual memory, input/output, CPU scheduling, file system, virtualization Introduction to system programming and familiarization with multiprocess and multithreading applications and the application of interprocess communication and synchronization. Familiarization with the command line of a Unix/Linux operating system
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to the structure of an operating system, Introduction to command line, Processes, Threads, Interporcess Communication, Process Synchronization, CPU Scheduling, Deadlocks, Memory Management, Virtual Memory, File System, Shell Programming, Virtualization

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Study</td><td>78 hours</td></tr><tr><td>Laboratory programming tutorials</td><td>26 hours</td></tr><tr><td>Programming exercises</td><td>32 hours</td></tr><tr><td>Course total</td><td>175 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	The final grade for the course will be calculated as 50% of the final examination, 30% of midterm exams and 20% of laboratory exercises. Participation in the midterms exams is optional. If a student does not participate the grade weight will be added in the weight of the final examination.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
[1] Λειτουργικά Συστήματα, A. Silberschatz, P. Galvin, G. Gagne, Ένατη Έκδοση, Εκδόσεις Γκιούρδας
[2] Modern Operating Systems, A. Tanenbaum, H. Bos, Fourth Edition, Pearson.
[3] Λειτουργικά Συστήματα, W. Stallings, Ένατη Έκδοση, Εκδόσεις Τζιόλα
[4] The Linux Programming Interface, Michael Kerrisk, 2010, No Starch Press
[5] Linux Kernel Development, Robert Love, Addison-Wesley Professional
[6] The UNIX Programming Environment, Kernighan & Pike
[7] The Linux Command Line, William E. Shotts Jr.

COURSE OUTLINE Computer Networks

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	403	SEMESTER	4
COURSE TITLE	Computer Networks		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	4	6
Laboratory work	1	

COURSE TYPE	General background
PREREQUISITE COURSES:	Suggested courses: Network Protocols and Architecture, Probability and Statistics.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek/English for Erasmus students.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes
As a result of successfully completing this course, students will: Understand the network and how does it function. Become familiar with essential network cabling and basic concepts Understand how the nodes exchange data (wired and wireless) Become familiar with data transmission through network Να κατανοούν πώς μεταφέρονται τα δεδομένα μέσω δικτύων Understand basic operations of data link layer. Understand the basics of error detection, and addressing at data link layer. Get familiar with the key protocols for local area networks (IEEE 802, e.g. Ethernet). Become familiar with virtual local area networks and their implementation. Describe the main quantitative methods of assessing network performance Recognize issues related to routing on IP networks Understand basic principles of packet switching and circuit switching networks Identify common security needs and network failure points
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Review of important networking concepts (architecture, layers, packet, routing, protocol hierarchies, network model -OSI). Network design issues, Transmission media (twisted pair cable; coaxial cables; optical fibers). Media access and media sharing, Local Area Network Technologies (ALOHA, CSMA, e.g.) Local area networks, Metropolitan area networks, Network devices (switch, router), Wide area networks, and packet switched networks, routing. Network security issues.

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use course’s webpage that keeps educational material of previous academic years and is updated every year.
Lectures typically use electronic presentations.
Students are divided in groups and perform laboratory exercises.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>13 X 4 = 52</td></tr>
<tr><td>Laboratory</td><td>7 X2 = 14</td></tr>
<tr><td>Exercises writing</td><td>26</td></tr>
<tr><td>Non directed study</td><td>58</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>150</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Because of the importance of understanding both the theoretical and hands-on elements of networking, students must pass the two components of the course (laboratory and exams) in order to receive a passing grade for the course.
Students must participate in final term exams (100%): (i) which includes questions and problem solving. (ii) Laboratory exercises. In Greek.
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Δίκτυα Υπολογιστών: Μια προσέγγιση από τη σκοπιά των συστημάτων. Peterson, L., and Bruce S. Davie. 4η Αμερικανική έκδοση, (2009), Εκδόσεις Κλειδάριθμος, 978-960-461-266-6.
Δίκτυα υπολογιστών, Tanenbaum, Andrew S , Ένατη Αμερικάνικη Έκδοση, (2012), Εκδόσεις Κλειδάριθμος, 9789604614479.
Τοπικά και αστικά δίκτυα (LANMAN), Σ. Μαργαρίτη, Ε. Στεργίου, (2006). Εκδόσεις Νέων Τεχνολογιών, 960-8105-95-1
Επικοινωνίες Υπολογιστών και Δεδομένων, W. Stallings, 8η έκδοση- 2016, Εκδόσεις Α. Τζιόλα & Υιοί , ISBN: 9789604183296
Δικτύωση Υπολογιστών: Προσέγγιση από Πάνω προς τα Κάτω, J.F. Kurose and K.W.Ross, Εκδόσεις Γκιούρδα, Έβδομη Έκδοση, 2018, ISBN: 978-960-512-7022.
Data Communications and Computer Networks A Business User's Approach, Curt M. White, 8th Edition (2015), CENGAGE Learning, ISBN-13: 978-1305116634 ISBN-10: 9781305116634
Computer Networking: A Top-Down Approach, James F. Kurose, Keith W. Ross (7th Edition) (2016), Pearson, ISBN-10: 0133594149, ISBN-13: 978-0133594140.
Guide to Networking Essentials, Greg Tomsho , Cengage (2016),ISBN: 9781305105430.

COURSE OUTLINE Databases I

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	404	SEMESTER	4	
COURSE TITLE	Databases I			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			4	6
Laboratory work			1	
COURSE TYPE	special background			
PREREQUISITE COURSES:	No PREREQUISITE COURSES			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	e-class			

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding of the foundations and basic concepts of Databases and Database Management Systems. Deep understanding of the core elements of Database Management Systems and their functions. Familiarization and ability to analyze and describe the requirements for creating any database. Familiarization and ability to model Database Management applications using tools such as Entity Relational diagrams (ER charts) and to design the relational representation of the Base using the ER diagram. Familiarization and ability to design procedures and use SQL commands to create tables / indexes, input / update / delete data, and query in a relational DBMS. Familiarization and ability to design and deploy applications and programs using the DBMS API.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to Database Management Systems (DBMS), Physical Storage. Architecture of a DBMS. Modeling data with the Entity-Relational Model. Relational model. Conversion of Entities-Relational Model in Relational. Relational Algebra. SQL language (data definition and management). Functional Dependencies and Normalization. Designing a BD. Physical organization of a DBMS. Storage media. Archives Organizations and Directories.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of the course’s webpage that keeps educational material of previous academic years which is updated every year.
Lectures typically use electronic presentations, writing, executing and criticizing segments of code.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>52 hours</td></tr>
<tr><td>Lab Exercises</td><td>13 hours</td></tr>
<tr><td>Study for delivering Lab Exercises</td><td>10 hours</td></tr>
<tr><td>Project</td><td>20 hours</td></tr>
<tr><td>Study</td><td>55 hours</td></tr>
<tr><td>Course total</td><td>150 hours</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Students must complete a project and lab exercises (30%).
Students must participate in final term exams (70%).
Successful delivery of Project assignment and examination of lab exercises are prerequisite for participating to final exam.
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Θεμελιώδεις αρχές συστημάτων βάσεων δεδομένων, Elmasri Ramez,Navathe Shamkant B. Εύδοξος : [12186]:
Συστήματα Βάσεων Δεδομένων 6η Έκδοση, Abraham Silberschatz, Henry F. Korth,S. Sudarshan. Εύδοξος : [12535833]
ΕΙΣΑΓΩΓΗ ΣΤΙΣ ΒΑΣΕΙΣ ΔΕΔΟΜΕΝΩΝ, ΤΑΜΠΑΚΑΣ ΒΑΣΙΛΕΙΟΣ Εύδοξος: [68406015]
- Related academic journals:
Ling Liu and Tamer M. Özsu (Eds.) (2009). "Encyclopedia of Database Systems, 4100 p. 60 illus. ISBN 978-0-387-49616-0.
Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems
Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts
Concepts of Database Management, Loose-Leaf Version, Joy L. Starks, Philip J. Pratt, et al. | Jan 25, 2018

COURSE OUTLINE Probability and Statistics

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	405	SEMESTER	4
COURSE TITLE	Probability and Statistics		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		4	5
Exercises		1	
COURSE TYPE	general background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/		

LEARNING OUTCOMES

Learning outcomes
The Students will be able to but not limited to: Apply key concepts of probability, including discrete and continuous random variables, probability distributions, conditioning, independence, expectations, and variances. Define and explain the different statistical distributions (e.g., Normal, Binomial, Poisson) and the typical phenomena that each distribution often describes. Apply the basic rules and theorems in probability including Bayes's theorem and the Central Limit Theorem (CLT). Define and demonstrate the concepts of estimation and properties of estimators. Apply the concepts of interval estimation and confidence intervals. Apply the concepts of hypothesis testing and p-value. Use standard software (e.g., R-Programming) to facilitate statistical analysis
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Decision-making Production of free, creative and inductive thinking.

SYLLABUS

Descriptive Statistics: Populations and Samples, Frequency tables and graphs, Grouped data and Histograms, Stem and Leaf plots, Box plots, Sample Mean, Sample Median, Sample Mode, Sample Variance and Sample Standard Deviation, Range, Quartiles, Inter-quartile range
Probability: Sample Space and Events of an Experiment, Properties of Probability Counting, Experiments having equally likely outcomes
Conditional Probability and Independence, Bayes' Theorem
Discrete Random Variables. Intuitive and mathematical definition of Random variables, Bernoulli's Distribution. Binomial random variable, Binomial Distribution, Expectation. Poisson random variable, Poisson distribution, Variance. Normal Distribution. Continuous Random Variable, Normal Random Variable, Probabilities associated with Standard Normal Random variable, Conversion to Standard Normal, Properties of Standard Normal Variables. Distribution of Sampling Statistics. Sample Mean, Central Limit Theorem. Sampling proportion, Distribution of Sample Variance of a Normal Population. Estimation. Point Estimator of Population Mean and Proportion, Estimating a Population Variance, Interval Estimators of Mean of a Normal Population with known Population Variance, Interval Estimators of Mean of a Normal Population with Unknown Population Variance, Interval Estimators

of Population Proportion. Testing Statistical Hypotheses. Hypothesis tests and Significance Levels, Hypothesis tests concerning Population Proportions for Large Sample. Hypothesis tests concerning the Mean of a Normal Population: Case of Known Variance (Large Sample), Case of Unknown Variance (Small Sample, t-test)

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>52 hours</td></tr><tr><td>Exercises</td><td>13 hours</td></tr><tr><td>Study</td><td>60 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	The final results for the course will be: - the final written test is weighting with 70% - the intermediate test with 30% Students must participate in final term exams (70%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

Applied statistics for engineers and scientists, Jay L. Belmont, CA : Thomson Brooks, 2005.
Applied statistics, J. Neter, Allyn and Bacon, Boston, 1988
R In Action: Data Analysis and Graphics with R by Kabacoff, Robert, Shelter Island, NY: Manning Publications Co. 2015
Πιθανότητες και Στατιστικής, Νικ. Μυλωνάς, Εκδόσεις Τζιόλας, 2013
Εισαγωγή στην Στατιστική, Αικ. Μπακούρα, Εκδόσεις Δίσιγμα, 2013.
Ανάλυση Δεδομένων με χρήση της R, Δημ. Φουσκάκης, Εκδόσεις Τσότρας 2013
Εισαγωγή στη στατιστική ανάλυση με την R (ελληνική μετάφραση), Crawley, M. J., Εκδόσεις Broken Hill 2014.
Εισαγωγή στις πιθανότητες με στοιχεία στατιστικής, Δ. Μπερτσεκάς, Γ. Τσιτσικλής, 1η έκδοση, Τζιόλα, 2013.
Στατιστική και Μηχανική Μάθηση με την R, Δημ. Ιωαννίδης, Ι. Αθανασιάδης, Εκδόσεις Τζιόλας, 2017

COURSE OUTLINE Embedded Systems

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	501	SEMESTER	5
COURSE TITLE	Embedded Systems		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	Special background		
PREREQUISITE COURSES:	Computer Architecture, Programming I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
Successful completion of the course will enable students to: Identify the basic building blocks of an embedded system Understand the requirements capture process and specification of an embedded system Understand design constrains as they emerge from non-functional requirements Understand the properties, function and techno-economic constraints of microcontrollers Understand basic operating principles of sensors and actuators Understand interfacing with analog peripheral devices and data digitization processes Understand the structure of communication protocols for digital peripherals Understand H/W design processes and involved toolchains Understand embedded S/W design flow and toolchains Design and develop simple embedded applications Understand the necessity for and intricacies of real time SW execution in a constrained environment.
General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Working independently, Teamwork, Enabling free, creative and productive thinking.

SYLLABUS

Analysis of the characteristics of design HW and SW for embedded systems. Techniques for requirement analysis and drafting specifications Building blocks and HW design flow for embedded systems Embedded SW design flow Issues on firmware design for real time operation In the context of laboratory assignments, students use a uC development system and IDE for the creation of specific-example applications.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	☒ Electronic, slide-oriented, presentations uploaded to e-class, ☐ Use of software during lecture, ☒ Use of specialized software, ☒ Electronic educational material available to e-class, ☒ Management of projects / exercises via website,

	☒ Communication with students via e-mail.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory practice	13 hours
Projects	25 hours
Study	48 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Language of Evaluation: Greek language (English for Erasmus students). The final grade of the course will come up as follows: 50% from the aggregate grade of the projects, 50% from the semester exams. In this framework, and according to the course's syllabus, students should deliver a small number of projects (up to 4) which will form the basis for their evaluation. In order to obtain a pass grade, students must deliver at least 50% of the assigned projects and be successfully evaluated. The evaluation methodology is presented to the students from the first lecture, it is written in the syllabus of the course, and available also to the course's e-class web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Basic structures of embedded systems, Konstantinos Kalovrektis ISBN 978-960-7996-48-0
Embedded systems: The invisible digital world, Minas Dasigenis and Dimitrios Soudris, (http://arch.icte.uowm.gr/mdasyg/book/embedded/), ISBN: 978-960-603-390-2
Computers as Components: Principles of Embedded Computing Systems Design, Wayne Wolf, ISBN: 978-155-860-541-1
Embedded System Design: Embedded Systems Foundations of Cyber-Physical Systems, Peter Marwedel, ISBN: 978-94-007-0256-1 (Print) 978-94-007-0257-8 (Online)
Building Internet of Things with the Arduino, Charalampos Doukas, ISBN 1470023431
- Related academic journals:
IEEE Micro ISSN: 0272-1732
IEEE Embedded Systems Letters ISSN: 1943-0663
https://www.eenewsembedded.com/

COURSE OUTLINE Artificial Intelligence

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	502	SEMESTER	5
COURSE TITLE	Artificial Intelligence		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		2	
COURSE TYPE	special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://www.dit.uoi.gr/e-class/courses/502/		

LEARNING OUTCOMES

Learning outcomes
After completing the course, student will Know the basic concepts and principles of Artificial Intelligence, will have understood the various applications of Artificial Intelligence. Understand and be able to implement basic Artificial Intelligence algorithms. Understand and have the ability to solve simple and complex problems by applying AI Algorithms. have acquire real-world problems solving skills, they will be able to define and choose the most appropriate algorithm for problem solving. They will be able to transform any problem into a search problem solving. Students will be able to model and solve complex restriction problems. will have understood the concept of knowledge representation and will be able to represent knowledge and infer conclusions using first order logic.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Principles and concepts of Artificial Intelligence, approaches and areas of A.I. Real world problems representation and solving. Search Algorithms, Blind Search Algorithms, Depth First Search, Breath First Search, Bi-directional Algorithms. Heuristics, Best Fist Algorithms, Hill Climbing, A* Algorithm. Games, min-max algorithm, a-b pruning algorithm. Constrain Satisfaction Problems and Algorithms, Backtracking search, local search, Arc consistency, AC3 algorithm. Knowledge representation, Logic, Propositional (Boolean) logic, Inference rules. First order logic, Unification, Generalized Modus Ponens, Forward chaining, Backward chaining, Resolution. Introduction to Prolog language

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Use of the course’s webpage that keeps educational material of previous academic years that is updated every year.
Lectures typically use electronic presentations, writing, executing and criticizing segments of code.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39 hours</td></tr>
<tr><td>Collaboration for project implementation</td><td>26 hours</td></tr>
<tr><td>Project implementation</td><td>15 hours</td></tr>
<tr><td>Study</td><td>45 hours</td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>The final results for the course will be:
- the final written test is weighting with 50%
- the intermediate test with 30%
-project implementation with 20%
Students must participate in final term exams (50%).
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

Τεχνητή Νοημοσύνη, Ι. Βλαχάβας, Π. Κεφαλάς, Ν. Βασιλειάδης, Φ. Κόκκορας, Η. Σακελλαρίου, Γ' Έκδοση, Εκδόσεις Πανεπιστημίου Μακεδονίας, 2011, ISBN: 978-960-8396-64-7
Τεχνητή Νοημοσύνη: Μια σύγχρονη προσέγγιση, S Russel, P. Norvig, ΚΛΕΙΔΑΡΙΘΜΟΣ, ISBN: 9602098732
Prolog Programming for Artificial Intelligence, Ivan Bratko 3rd edition, Addison Wesley, 2000.
Principles of Constraint Programming, Krzysztof Apt Cambridge University Press, 2003.
Knowledge Representation and Reasoning, R.J. Brachman and H.J. Levesque, Morgan Kaufmann, 2004.
Artificial Intelligence: A New Synthesis, San Francisco: Morgan Kaufmann, 1998.

COURSE OUTLINE Digital telecommunications

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	503	SEMESTER	5
COURSE TITLE	Digital telecommunications		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		2	
COURSE TYPE	General background, General Knowledge, Skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding and calculation of the spectrum of modulated signals Analysis and description of the technique of sampling Analyzing the differences between ideal and practical sampling Explanation of quantization techniques and the types of encoding Design of PCM systems for specific requirements Recognition of basic zone digital modulation techniques ant their waveforms Design of the optimal demodulator and detector Explanation of the digital modulation techniques with carrier (ASK, PSK, FSK) ant their waveforms Generation of modulated, demodulated signals by means of laboratory equipment and simulation software (AWARDE of NI).
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

The course includes the procedures of transforming an analogue signal to a digital signal and the transmission over a channel of basic and pass band. Initially, the analogue/digital transformation, which includes the sampling/quantization/encoding. Consequently, the basic band modulation (PAM, PPM,etc) and their performance is in depth studied, the procedure of designing the optimal receiver is analyzed and the procedure of designing the optimal filters for emission and reception for the zero setting of the intersymbol interference is presented. Finally, the schemes of basic band modulation (ASK, PSK, FSK, QAM, QPSK) are studied both with coherent and noncoherent demodulation. For the laboratory part of the course, the laboratory equipment and the specialized software AWARDE of Ni are used.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year.

	Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	The final score of the course will be 70% of the final written exams and 30% of the midterm written exams. For the laboratory exams the evaluation criteria for "successful/not successful'' will be applied. The students that fail in the laboratory exams will not participate in the final exams of the course. Attendance of the laboratory exercises is obligatory. All students are required to deliver 3 essays, that are also evaluated with the "successful/not successful" criteria, in order to be examined for the laboratory part. If an essay is rated not successful the student is obliged to repeat the essay and to be re-examined before the upcoming of the laboratory part of the course. For succeeding the exams, the score of the written exams should be at least 50/100. Successful examination of the laboratory part of the course can be preserved for the following years. The midterm score is valid only for the current exams period. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

Activity	Semester workload
Lectures	39 hours
Laboratory practice	26 hours
Study and analysis of bibliography	10 hours
Essay writting	10 hours
Study	40 hours
Course total	125 hours

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
A. Bateman, Ψηφιακές επικοινωνίες, 1η έκδοση, Τζιόλα, 2000. Κωδικός στον Εύδοξο: 18548676.
A. Sklar, Ψηφιακές Επικοινωνίες, 2η έκδοση, Παπασωτηρίου, 2011. Κωδικός στον Εύδοξο: 12400399.
M. Fitz, Βασικές αρχές συστημάτων επικοινωνίας, 1η έκδοση, Κλειδάριθμος, 2012. Κωδικός στον Εύδοξο: 22769688.
S. Haykin, Ψηφιακά Συστήματα Επικοινωνιών, 1η έκδοση, Παπασωτηρίου, 2014. Κωδικός στον Εύδοξο: 33197231.
S. Haykin, M. Moher, Συστήματα Επικοινωνίας, 5η έκδοση, Παπασωτηρίου, 2010. Κωδικός στον Εύδοξο: 41963451.
J. Proakis, M. Salehi, Συστήματα Τηλεπικοινωνιών, 1η έκδοση, Φούντας, 2015. Κωδικός στον Εύδοξο: 50657744.
K. Sam Shanmugam, Ψηφιακά και αναλογικά συστήματα επικοινωνίας, 1η έκδοση, Α. Γ. Πνευματικός, 1979. Κωδικός στον Εύδοξο: 6929.

COURSE OUTLINE Algorithms and complexity

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	504	SEMESTER	5	
COURSE TITLE	Algorithms and complexity			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Laboratory work			1	
COURSE TYPE	special background			
PREREQUISITE COURSES:	Programming II			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No			
COURSE WEBSITE (URL)				

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding and usage of the asymptotic notation to express algorithmic efficiency. Deep understanding of the concept of algorithmic efficiency. Familiarization and ability to apply the algorithmic technique of Divide and Conquer. Familiarization and ability to apply the algorithmic technique of Greedy Algorithms. Familiarization and ability to apply the algorithmic technique of Dynamic Programming. Understanding graph algorithms, common algorithms over graphs (e.g. shortest paths). Understanding of the concept of computability. Understanding of the NP class of problems and their reductions. Familiarization with approximation algorithms, practical applications,
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Asymptotic notation (O, o, Ω, ω, Θ, θ). Algorithmic complexity (average, worst case). Algorithmic complexity analysis of various sorting algorithms. Random algorithms. Divide and Conquer. Greedy algorithms. Backtracking algorithms (stable marriages, 8-queens). Dynamic Programming (knapsack). Graphs, graph representations. Depth First Search, Breadth First Search. Minimum Spanning Tree (Kruskal, Prim). Shortest paths starting from one vertex (Dijkstra, Bellman Ford). All pairs shortest paths (Floyd Warshall). Computational complexity. Computability. Problem classes (P, NP). The P vs NP problem. NP completeness, reductions. Approximation algorithms.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of the course’s webpage that keeps educational material of previous academic years which is updated every year.
Lectures typically use electronic presentations, writing, executing and criticizing segments of code.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39 hours</td></tr>
<tr><td>Laboratory work</td><td>13 hours</td></tr>
<tr><td>Study</td><td>53 hours</td></tr>
<tr><td>Project</td><td>20 hours</td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Students must complete a programming project accompanied with a technical report (20%).
Students must participate in mid-term exams (20%).
Students must participate in final term exams (60%).
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Εισαγωγή στους αλγορίθμους, Thomas H. Cormen, Charles E. Leiserson, Ronald L Rivest, Clifford Stein, 3η έκδοση – 2016, Πανεπιστημιακές Εκδόσεις Κρήτης, ISBN: 978-960-524-473-6
Ανάλυση και Σχεδίαση Αλγορίθμων, Levitin Anavy, 3η έκδοση – 2018, Εκδόσεις Τζιόλλα, ISBN: 978-960-418-732-4
Αλγόριθμοι, Παναγιώτης Μποζάνης, 2η έκδοση – 2017, Εκδόσεις Τζιόλλα, ISBN: 978-960-418-667-9
Αλγόριθμοι Σχεδίαση και Εφαρμογές, Michael T. Goodrich, Roberto Tamassia, 2016, Εκδόσεις Γκιούρδα, ISBN: 978-960-512-6971
An Introduction to the Analysis of Algorithms, Robert Sedgewick, Philippe Flajolet, 2nd edition – 2013, Addison-Wesley Professional, ISBN-13: 978-0321905758
Algorithms Unlocked, Thomas H. Cormen, 2013, The MIT Press.
Algorithms, Robert Sedgewick, Kevin Wayne, 4th edition – 2011, Addison-Wesley Professional, ISBN-13: 978-0321573513
- Related academic journals:
ACM Transactions on Algorithms
Journal of Algorithms and Computational Technology

COURSE OUTLINE Software Engineering

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	505	SEMESTER	5	
COURSE TITLE	Software Engineering			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Laboratory work			2	
COURSE TYPE	special background			
PREREQUISITE COURSES:	Object-Oriented Programming (prerequisite), Databases I (advised)			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No			
COURSE WEBSITE (URL)				

LEARNING OUTCOMES

Learning outcomes
The student will be able to create a simple software requirements specification document to analyze software requirements and design object-oriented software, using analysis technics and UML models. to implement the software design in object-oriented language. The student will also learn about principles and methods of agile software development.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Project planning and management Production of free, creative and inductive thinking

SYLLABUS

Software development activities. Iterative processes vs waterfall process, agile processes, principles of agile software development. Introduction to Scrum and Extreme Programming. Requirements engineering: requirements management, principles for good requirements and SRSs, requirement models, functional and non-functional requirements, use cases, and user stories. UML models, with emphasis on activity, verb and noun phrase analysis, CRC, boundary-control-entity class categories. Introduction to object-oriented design (OOD) principles and good programming practices. A simple OOD example: requirements development, analysis and design, implementation. Guided eaching of the example in the lab. Optional guided homework of small development project.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face in the classroom. Optional guided homework of small development project (meetings, as well as email support).
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the instructor's notes, code examples, and selected book chapters. Use of IDE, object-oriented language, UML diagramming software.

<table>
<tr><td></td><td>Students communicate with the instructor using email and e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39 hours</td></tr>
<tr><td>Laboratory work</td><td>26 hours</td></tr>
<tr><td>Study</td><td>60 hours</td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Final written exam.
Presentation of optional guided homework of small development project.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested texts:

Selected sections from Deitel and Deitel (2012), Chapters 12 and 13, Fowler (2003), IEEE ISO IEC (2011).

- References:

Arlow, J., Neustadt, I. (2005) "UML 2 and the Unified Process Practical Object Oriented Analysis and Design, 2nd edition", Addison-Wesley.

Cockburn, A. (2000) "Writing Effective Use Cases", Addison-Wesley.

Constantine, L.L., Lockwood, L.D.A. (2001) "Structure and style in use cases for user interface design", in van Harmelen, M. (ed.), "Object-Modeling and User Interface Design", Addison-Wesley.

Deitel P.J., Deitel H.M. (2012) “Java, How to Program, 9th Edition", Prentice Hall (Chapters 12 και 13).

Fowler, M. (2003a) “UML Distilled, A Brief Guide to the Standard Object Modeling Language”, 3rd edition, Addison-Wesley.

Fowler, M., Beck, K., Brant. J., Opdyke, W., Roberts, D. (2000) "Refactoring, Improving The Design Of Existing Code", Addison-Wesley.

IEEE ISO IEC (2011) "Systems and software engineering - Life cycle processes - Requirements engineering, standard IEEE 29148".

Kniberg, H. (2007) "Scrum and XP from the Trenches, How We Do Scrum, 2nd edition", InfoQ.

Larman, C. (2004) "Applying UML and Patterns, An Introduction To Object Oriented Analysis and Design and the Unified Process, Third Edition", Addison Wesley Professional.

Larman, C. (2003) “Agile And Iterative Development, A Manager's Guide”, Addison-Wesley.

Martin, R.C (2002a) "Agile Software Development, Principles, Patterns, and Practices", Prentice Hall.

Martin, R.C. (2002b) "UML for Java Programmers", Prentice Hall.

"Manifesto for Agile Software Development", http://agilemanifesto.org

Rosenberg, D., Stephens, M. (2007) "Use Case Driven Object Modeling with UML, Theory and Practice", APress.

Rumbaugh, J., Jacobson, I., Booch, G. (2005) “UML Reference Manual”, 2nd edition, Addison-Wesley.

Wiegers, K., Beatty, J. (2013) "Software Requirements, Third Edition", Microsoft Press.

COURSE OUTLINE Broadband networks

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	506	SEMESTER	5	
COURSE TITLE	Broadband networks			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Laboratory work			1	
COURSE TYPE	General background			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/506/			

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Know the feasibility of xDSL technology and to recognize the types and the basic characteristics of this technology. Become familiar with WDM operating principles and Gigabit Ethernet networking features Be able to calculate whether a visual link works properly, by checking its budget power and its dispersion phenomenon. Be able to check if split optical (WDM) lines work satisfactorily. Understand the feasibility of ADMUX, Cross Connect, Amplifier, Splitter and other essential optical network components. Become familiar with basic routing methods that are used on Cross Connect devices. Understand the role of FFTx technology connections. Understand and operate Gigabit Ethernet links. Understand the role of multistage interconnection networks Understand the techno-economic issues that are involved in broadband networks.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of computer networks (wired or optical), with the use of the necessary technology Adapting to new situations Decision-making Working independently Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Basic definitions. - xDSL Technologies, Broadband Link Budgeting, Calculate dispersion of Broadband Links and split optical broadband link. WDM Network Technology, DWDM Technology, CWDM Technology. Cross Connect devices and routing issues of Cross Connect devices. Ethernet 1, 10, 40 100 Gbps technologies. Basic features and way of using Giga-Ethernet technologies. FFTx Networks. ATM Network. Multistage Interconnection Networks. Multi-Channel Switching Systems. Multiprotocol Label Switching Protocol (MPLS). Techno-economic issues that are involved in broadband networks

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Managing exercises for better understanding Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	The final results for the course will be: - the final written test is weighting with 60% - the intermediate test with 30% - the project is rated with a factor of 10%. Students don't have to attend the lab. Students must complete a project accompanied with a technical report (30%). Students must participate in final term exams (60%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

Activity	Semester workload
Lectures	39 hours
Study	50 hours
Laboratory work	13 hours
Project	13 hours
Course total	125 hours

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Δίκτυα ευρείας ζώνης, τεχνολογίες & εφαρμογές με έμφαση στο διαδίκτυο, Βενιέρης Ι., Εκδόσεις Τζιόλα, ISBN : 9789604182039
Broadband Network Architectures by Chris Hellberg, Truman Boyes, Dylan Greene, Prentice Hall, ISBN-13: 978-0132300575
Integrated Broadband Networks, by Byeong Gi Lee, Woo-June Kim, Artech House, ISBN-13: 978-1580531634
Building Broadband Networks by Marlyn Kemper Littman, CRC Press, ISBN-13: 978-0849308895
IP over WDM 1st Edition, by Kevin H. Liu, wiley press, ISBN-13: 978-0470844175
FTTx Networks: Technology Implementation and Operation, Morgan Kaufmann, iSBN-13: 978-0124201378
Σημειώσεις και Ασκήσεις Καθηγητή

- Related academic journals:

IEEE Communications Magazine: https://www.comsoc.org/publications/magazines/ieee-communications-magazine
Journal of Networking Technology: http://www.dline.info/jnt/aim.php
Optical Switching and Networking: https://www.sciencedirect.com/journal/optical-switching-and-networking

COURSE OUTLINE «DIGITAL SIGNAL PROCESSING»

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	601	SEMESTER	6
COURSE TITLE	Digital Signal Processing		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory work	1	
Exercises	1	

COURSE TYPE	General Background, specialized General Knowledge, Skills Development
PREREQUISITE COURSES:	Signals & Systems
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
This course will develop digital signal processing (DSP) theory and methods with the following objectives: To give the students a comprehension of the concepts of discrete-time signals and systems. To give the students a comprehension of the Z- and the Fourier transform and their inverse. To give the students a comprehension of the relation between digital filters, difference equations and system functions. To give the students' knowledge about the most important issues in sampling and reconstruction. To make the students able to apply digital filters according to known filter specifications. To provide the knowledge about the principles behind the discrete Fourier transform (DFT) and its fast computation. To make the students able to apply Fourier analysis of stochastic signals using the DFT. To be able to apply the MATLAB programme to digital processing problems and presentations.
General Competences
Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

Part I - Introduction to Digital Signal Processing.
Discrete-time sequences and systems.
Linear time-invariant (LTI) systems.
Impulse response and convolution.
The Z-transform and its inverse.
Difference equations and system functions.
Signal flow graphs.
Fourier transforms and frequency response.
Periodic sampling and reconstruction of band limited signals.
Part II - Filter design and Fourier signal analysis.
Up- and down sampling.
Design of IIR- and FIR-filters.
Digital filter structures (direct, cascade, parallel and lattice).
Filter transformations.
All-pass, minimum phase systems.
The discrete and fast Fourier transform.

Circular convolution, block convolution.
Fourier analysis, the effect of windowing.
Part III - Advanced digital signal processing analysis
Nonlinear Signal Processing and its applications to telecommunications, biosignals etc.
Time-frequency analysis.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of electronic presentations posted in e-class. Provide educational material through e-class. Managing work / exercises through a website. Electronic communication of instructors and students, through the course webpage and by e-mail.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Assessment of the course will result from the combination of their performance: In two intermediate tests that will be conducted during the semester, which will include multiple choice tests and problem solving (20/100). Written projects containing the analysis of the laboratory exercises (20/100) The final examination of the course, which will include problem-solving exercises (60/100). To solve the problems, we will evaluate the correct method of solving (50/100), the understanding of the functions (30/100), the correct numerical solution and the extraction of results (20/100). For all the above, there will be corresponding material posted on the course website, with many similar examples of equally difficult, for each learning module, as well as indicative examples of written assignments and laboratory exercises.

Activity	Semester workload
Lectures	39 hours
Project writing	20 hours
Laboratory work	26 hours
Study	40 hours
Course total	125 hours

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Ψηφιακή Ανάλυση Σήματος, Proakis J., Manolakis D. Εκδόσεις Ίων, 2010.
Βασικές Τεχνικές Ψηφιακής Επεξεργασίας Σημάτων, Μουστακίδης, Γ.Β., Εκδόσεις Τζιόλα, 2004.
Ψηφιακή Επεξεργασία Σήματος, Hayes M.H., Εκδόσεις Τζιόλα, 2000.
Ψηφιακή Επεξεργασία Σήματος, Φωτόπουλος Σ.Δ., Εκδόσεις Φωτόπουλου, 2010.
- Related academic journals:
IEEE transactions on Signal Processing, IEEE.
IEEE Journal on Selected Topics in Signal Processing
IEEE Signal Processing Magazine
Signal Processing, Elsevier

COURSE OUTLINE Telecommunication Systems

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	602	SEMESTER	6
COURSE TITLE	Telecommunication Systems		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		2	
COURSE TYPE	General background, general knowledge, skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Description of the structure of a cellular system Description of different types of interference Description of the way cellular systems can serve numerous users in a limited spectrum Calculation of the efficiency of a wireless communication system Description of the effect of mobility on the systems efficiency Description of ways of disposal of radio resources to users Description of ways of improving the capacity of a cellular system Description of the principles and the structure of systems of multiple carriers Description of the effect of fading on wireless digital communication systems
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Working independently Team work Working in an interdisciplinary environment Production of free, creative and inductive thinking

SYLLABUS

introduction to telecommunication systems. Fundamental principles and architectures of cellular systems. Re-use factor. Telecommunication traffic. interference of a neighboring channel and wireless system capacity. Techniques for improvement of a wireless system's efficiency. Allocation and disposal of wireless resources. Multiple-carrier systems. Digital communications in fading channels.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises.

	Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Exercises	26 hours
Essay writting	12 hours
Study	48 hours
Course total	150

STUDENT PERFORMANCE EVALUATION	The final score for the course will be 70% from the final written exams and 30% from the midterm exams in the middle of the semester. For succeeding the exams, the score of the written exams should be at least 50/100. Successful examination of the laboratory part of the course can be preserved for the following years. The midterm score is valid only for the current exams period. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Μ.Θεολόγου, Δίκτυα κινητών και προσωπικών επικοινωνιών, 2η έκδοση, Τζιόλα, 2010. Κωδικός στον Εύδοξο: 18548787.
Αθ.Κανάτας, Φ. Κωνσταντίνου, Γ. Πάντος, Συστήματα Κινητών Επικοινωνιών, 2η έκδοση, Παπασωτηρίου, 2013. Κωδικός στον Εύδοξο: 33154041.
Σημειώσεις του διδάσκοντα

COURSE OUTLINE «IMAGE PROCESSING»

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	603	SEMESTER	6	
COURSE TITLE	Image Processing			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Laboratory work			1	
Exercises			1	
COURSE TYPE	General Background, specialized General Knowledge, Skills Development			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	e-class			

LEARNING OUTCOMES

Learning outcomes
The learning objectives of this course are summarized as follows: Familiarity with the representation and nature of the gray level image of the multi-channel color image. Understanding the image as a multidimensional signal and matching the concepts of signal theory to multidimensional image spaces Learning image enhancement techniques, filtering and spatial transformations. Familiarizing with segmentation and object detection techniques. Applying techniques for the improvement and segmentation of images in different fields Information on new trends in the field of image processing, the progress of machine learning into the field. The calculation of quantification values from segmented objects and the extraction of local and holistic features.
General Competences
Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

The image processing lesson specializes in image processing techniques and heals a variety of research questions. Image processing applications extend into multiple fields, from microscopy or medical imaging to astrophysics. The main stages of the processing are in the following order: a) image improvement, which is done either as an end in itself or with the aim of converting the image into a form easily exploitable in subsequent processing and analysis; b) the segmentation in which its pixels images with similar characteristics are grouped by naming different finds and objects; c) extracting quantifiable values from fragmentation findings. The aim of the course is to familiarize the student with the basic concepts of image processing and analysis and to get acquainted with the techniques and algorithms. It employs specific improvement techniques using filters and geometric transformations, and techniques of segmentation of different categories. Computer evolution, access to computing resources, and the diffusion of parallel processing systems has given a lot of momentum to the field in recent years, through the direct application of engineering techniques at the pixel level. Nowadays, the semantic approach of detecting objects using increasingly sophisticated classification techniques is progressing steadily. The structure of the course places particular emphasis on the chronological evolution of the field, and results in the new tendencies that are newly formed.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of electronic presentations posted in e-class. Provide educational material through e-class. Managing work / exercises through a website. Electronic communication of instructors and students, through the course webpage and by e-mail.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>78 hours</td></tr><tr><td>Project writing</td><td>12 hours</td></tr><tr><td>Non-directed Study</td><td>90 hours</td></tr><tr><td>Course total</td><td>180 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	Assessment of the course will result from the combination of their performance: In two intermediate tests that will be conducted during the semester, which will include multiple choice tests and problem solving (20/100). Written projects containing the analysis of the laboratory exercises (20/100) The final examination of the course, which will include problem-solving exercises (60/100). To solve the problems, we will evaluate the correct method of solving (50/100), the understanding of the functions (30/100), the correct numerical solution and the extraction of results (20/100). For all the above, there will be corresponding material posted on the course website, with many similar examples of equally difficult, for each learning module, as well as indicative examples of written assignments and laboratory exercises.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

R. Gonzalez and R. Woods. Ψηφική Επεξεργασία Εικόνας, Εκδόσεις Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε., 2010, ISBN: 978-960-418-2.

Ν. Παπαμάρκος, Ψηφιακή επεξεργασία και ανάλυση εικόνας. Β. Γκιούρδας Εκδοτική. 2010, ISBN: 978-960-92731

- Related academic journals:

IEEE transactions on Image Processing, IEEE.
International Journal of Computer Vision, Springer.
Image and Vision Computing
Computer Vision and Image Understanding
Eurasip Journal on Image and Video Processing

COURSE OUTLINE Information System Security

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	604	SEMESTER	6	
COURSE TITLE	Information System Security			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Laboratory work			1	
Exercises			1	
COURSE TYPE	special background			
PREREQUISITE COURSES:	No PREREQUISITE COURSES			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	e-class			

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding of the foundations and basic tools of Cryptography and Network Security. Deep understanding of the security issues/threats both at hardware level (side path attacks, error attacks, Trojan Hawks) and software (malware, unauthorized code changes) as well as at network level (network security, wired or wireless network security protocols and sensor networks). Deep understanding of various protocols for network security to protect against the threats in the networks Familiarization and ability to learn about how to maintain the Confidentiality, Integrity and Availability of a data. Familiarization and ability to encrypt and decrypt messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms. Familiarization and ability to analyze existing authentication and key agreement protocols, identify the weaknesses of these protocols. Understanding of the issues related to the protection of personal data and the use of anonymous certificates. Familiarization and ability to implement modern, advanced, symmetric and asymmetric cryptographic algorithms
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Algorithms and Cryptography. Security Assessment Models. Design Secure Cryptographic Systems. Cryptography and Cryptanalysis. Information Theory. Key Equivocation. Counting average number of spurious keys. Unicity Distance. Hash functions. Key distribution, Stream and block Cryptographic algorithms. Block Ciphers, meet-in-the-middle attack. Key Scheduling Algorithms. Linear and

Differential Cryptanalysis. Public Key Cryptography Schemes. The concept and the use of Digital Signature Schemes., Authentication applications. IP Security and Web security. Wireless Network Security.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Students must deliver lab exercises (50%). Students must participate in final term exams (50%). Written final exam (50%) includes: Multiple choice questions Critical Analysis Questions Comparison/ evaluation of theoretical foundations Successful delivery of lab assignments are prerequisite for participating in the final exam. The evaluation criteria are communicated to the students in the first lecture, which are explicitly mentioned in the curriculum, which is also available in the electronic classroom Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

Activity	Semester workload
Lectures	39 hours
seminars	13 hours
Laboratory practice	13 hours
Writing lab assignments	15 hours
Study	45 hours
Course total	125 hours

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Κρυπτογραφία, Πουλάκης Δημήτριος Μ. Εύδοξος [11068]:
Κρυπτογραφία για Ασφάλεια Δικτύων Αρχές και Εφαρμογές, Stallings Εύδοξος: [12777632]:
- Related academic journals:
N. Ferguson, B. Schneier, and Tadayoshi Kohno, Cryptography Engineering, John Wiley & Sons, March 15, 2010, ISBN: 9780470474242.
W. Stallings, Cryptography and Network Security, Prentice Hall, 2004.
-Συναφή επιστημονικά περιοδικά:
N. Sklavos, X. Zhang, Wireless Security & Cryptography: Specifications and Implementations, CRC-Press, A Taylor & Francis Group, ISBN: 084938771X, 2007.
Rodriguez-Henriquez, N.A. Saqib, A. Diaz Perez, C. Kaya Koc, Cryptographic Algorithms and Reconfigurable Computing, Springer, ISBN 0387338837, 2006.
Darrel Hankerson, Alfred Menezes, and Scott Vanstone, "Guide to Elliptic Curve Cryptography", Springer, 2004.
Stefan Mangard, Elisabeth Oswald, Thomas Popp, "Power Analysis Attacks: Revealing the Secrets of Smart Cards", Springer, 2007.
David Challener, Kent Yoder, Ryan Catherman , David Safford ,Leendert Van Doorn, "A practical guide to trusted computing", IBM Press, 2007.
James S. Kraft, Lawrence C. Washington, "An Introduction to Number Theory with Cryptography", Chapman and Hall/CRC, 2013.

Luther Martin, “Introduction to Identity-Based Encryption”, (Information Security and Privacy Series), Artech House, 2008.
Paris Kitsos and Yang Zhang, “RFID Security: Techniques, Protocols and System-On-Chip Design”, Springer, 2008.
Yang Zhang and Paris Kitsos, “Security in RFID and Sensor Networks”, Auerbach Publications, 2009.
James Joshi, “Network Security: Know It All”, Morgan Kaufmann, 2008.
Stefan Mangard, Elisabeth Oswald, Thomas Popp, “Power Analysis Attacks: Revealing the Secrets of Smart Cards”, Springer, 2007.
Mohammad Tehranipoor, Cliff Wang, “Introduction to Hardware Security and Trust”,

COURSE OUTLINE Innovation and Entrepreneurship

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	611	SEMESTER	6
COURSE TITLE	Innovation and Entrepreneurship		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	Special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
Successful completion of the course will enable students to: Understand the concepts, terminology and ecosystem around entrepreneurship and business innovation, Understand the process for definition and analysis of a business idea, Identify the innovation potential of an idea and transpose it to a business competitive advantage, Identify the basic structure and operating principles of an enterprise, Understand the challenges faced by start-ups and the business evolution steps, Understand funding principles (focused on VC investments), Understand globalisation as a business environment, Prepare basic business plans.
General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Decision making, Production of free, creative and inductive thinking, Working independently, Teamwork, Enabling free, creative and productive thinking, Project management.

SYLLABUS

Analysis of the concepts of entrepreneurship. Characteristics of business innovation. Building and developing start-ups. In the context of the course, students participate in a business game, where they are called to form founders' teams and develop and promote an innovative business idea to a business angel.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	☒ Electronic, slide-oriented, presentations uploaded to e-class, ☐ Use of software during lecture, ☒ Use of specialized software, ☒ Electronic educational material available to e-class, ☒ Management of projects / exercises via website, ☒ Communication with students via e-mail.

TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory work	13 hours
Project	48 hours
Non-directed study	25 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Language of Evaluation: Greek language (English for Erasmus students). According to the course's syllabus, students should deliver a business plan as project, which will form the basis for their evaluation. Projects and presentations can be delivered in Greek or English language. The final grade of the course will come up as follows: 50% from the project evaluation, 50% from the project presentation and oral exam. The evaluation methodology is presented to the students from the first lecture, it is written in the syllabus of the course, and available also to the course's e-class web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
John Bessant & Joe Tidd: Innovation & Entrepreneurship ISBN: 978-960-418-603-7
David Deakins, Mark Freel: Entrepreneurship and small businesses 2nd Ed. ISBN: 978-618-5131-27-2

COURSE OUTLINE Research Methodology and Scientific Writing

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	600	SEMESTER	6
COURSE TITLE	Research Methodology and Scientific Writing		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		2	5
Laboratory work		2	
COURSE TYPE	special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/		

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of this course the students will be able to: Explain the meaning of scientific research and scientific principles Explain research identification process and problem formulation Explain the meaning of research hypothesis and determination of research variables Explain how to cite references Explain and write examples of citation references Describe different scientific research methods (e.g. observations, experiments) and the different methods of results analysis (i.e. qualitative, quantitative) Describe research and scientific ethics Explain and write a scientific paper based on research Create presentation of research results in the form of Power Point and poster
General Competences
The general competences acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Production of free, creative and inductive thinking Project planning and management Team work Production of new research ideas Working independently

SYLLABUS

Introduction. Meaning of research, scientific method and research steps. Various research methods. Scientific ethics and science norms. Plagiarism. Identification and formulation of research problems. Scientific writing. Meaning and criteria of a scientific writing. Types of scientific writing.
Literature reviews. Significance of references in a research. Techniques and rules of citing references. Techniques in writing references. Hypothesis, variables and research data.
Results presentation of data and illustration writing. Data processing and methods of analysis. Qualitative data analysis methods. Quantitative data analysis methods. Abstract writing and summary of research results. Writing undergraduate thesis.
Structure of undergraduate thesis – general format and sequence. Undergraduate thesis writing technique (research results report): establishment of topic and title, technical requirements in writing chapters and sub-chapters, presentation of data (tables and figures), results and discussion

writing, references, conclusions and recommendation. Presentation writing of research results. Writing power point.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of electronic (slide) presentations posted on the e-class platform. Use of software for demonstration purposes during lectures. Use of specialized software. Educational material is posted on the e-class platform. Students communicate with the instructor using emails and the discussion forum of the course provided by the e-class platform
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>26 hours</td></tr><tr><td>Laboratory practice</td><td>26 hours</td></tr><tr><td>Project</td><td>25 hours</td></tr><tr><td>Essay writing</td><td>25 hours</td></tr><tr><td>Study and analysis of bibliography</td><td>23 hours</td></tr><tr><td>Course total</td><td>125 (hours)</td></tr></table>
STUDENT PERFORMANCE EVALUATION	The course is assessed through a project in the form of scientific paper. Each student is required to submit an assigned paper in the area of Informatics and Telecommunications at the end of the course. Papers are based on literature studies, field observation, internet and other necessary sources. Plagiarized paper will receive zero grade. The final score for the course will be 80% from the final assigned paper and 20% from the oral presentation. Evaluation criteria are available to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

Πώς να συντάξετε μια επιστημονική εργασία, 1η έκδοση, J. Bell, Μεταίχμιο, 2007. Κωδικός στον Εύδοξο: 24255.
Μεθοδολογία Εκπαιδευτικής Έρευνας, Παπαναστασίου, Κ., Αυτοέκδοση, Λευκωσία, 2005.
Πώς γίνεται μια επιστημονική εργασία;, Κ. Ζαφειρόπουλος, 2η έκδοση, Κριτική, 2015. ISBN: 978-960-586-077-6. Κωδικός στον Εύδοξο: 50659255
Μεθοδολογία Εκπόνησης Διπλωματικών Εργασιών, Κυριαζόπουλος Π.– Σαμαντά Ε., Εκδόσεις Σύγχρονη Εκδοτική, 2011
Μεθοδολογία Επιχειρηματικής Έρευνας, Δημητριάδη Ζωή, εκδ. Interbooks, 2000
Research design: Qualitative, quantitative and mixed methods approaches. Creswell, J. W., 5th Ed. Thousand Oaks, CA: Sage, 2018. ISBN: 978-1-5063-8670-6
Research Methods in Information (2nd ed. Vol. 2nd Edition), Pickard, A. (2013), London, United Kingdom: Facet Publishing
Research Methodology: a step-by-step guide for beginners (3rd edition), Kumar, R. (2011), London, UK: TJ International Ltd, Padstow, Corwall.
Practical Research: Planning and design, Leedy, P. D. (1980), Washington: Mc Millan Publishing Co., Inc.
Fundamental of Research Methodology and Statistics, Singh, Y. K. (2006), New Delhi. New International (P) Limited, Publishers.

COURSE OUTLINE Project management

GENERAL

SCHOOL	Informatics and Telecommunications
ACADEMIC UNIT	Informatics and Telecommunications

LEVEL OF STUDIES	Graduate		
COURSE CODE	605C	SEMESTER	6
COURSE TITLE	Project management		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures and assignment		3	5
Exercises		1	
COURSE TYPE	General background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://www.dit.uoi.gr/e-class/courses/uoi605C/		

LEARNING OUTCOMES

Learning outcomes
Successful completion of the course will enable students to: Understand the key and critical features of the projects, linking them to broader economic and business objectives and project life cycle principles. Know the tools and techniques of project management and how they are used to ensure the successful completion of projects in time and within the budget. Identify key roles in a real or case study case and appreciate the role of stakeholders in the implementation of the project. Use project management methodologies to identify key elements such as critical path, dependencies, and a realistic timetable. Analyze and calculate the core cost of the project and link it to the project timetable. Apply time planning and optimization methods to practical problems of organizing projects Create and present a project in a project case study that includes the organization of the project, the distribution of key tasks, and the key project plans (Environmental Analysis - Communications, Objectives, Work Structure Analysis, Chronoprogramming, and Budget Use appropriate software to implement the corresponding methodologies
General Competences
Organizational and project management capabilities Adapt to new situations. Decision making. Autonomous work. Teamwork. Design and project management. Exercise of criticism and self-criticism. Promoting free, creative and inductive thinking.

SYLLABUS

What is a project, a concept of a project, the characteristics of a project, the basic elements of a project? Project life cycle, life cycle characteristics of a project, project phases, project planning planning, execution and project control and monitoring.
Human resources management in the projects, human resources management functions, human resources hiring in the projects.
What is feasibility study, feasibility study, feasibility study stages, feasibility study products
What is a Gantt chart, create a Gantt chart. network diagrams, network designations, node or branch activities, AOA network rules, fictional activity.
What is Critical Path Critical Path, Critical Path Method, steps in the CPM process.
Program Evaluation and Review Technique, Work Breakdown Structure or WBS).
What is the nature of communication within the organizational frameworks in the projects, forms of communication

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	☒ Electronic, slide-oriented, presentations uploaded to e-class, ☒ Use of software during lecture, ☒ Use of specialized software, ☒ Electronic educational material available to e-class, ☒ Management of projects / exercises via website, ☒ Communication with students via e-mail.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Project	21 hours
Exercises	13 hours
Non-directed study	52 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Language of Evaluation: Greek language (English for Erasmus students). According to the course's syllabus, students should deliver a project, which will form the basis for their evaluation. Projects and presentations can be delivered in Greek or English language. The final grade of the course will come up as follows: 50% from the project evaluation and presentation 50% from the oral exam. The evaluation methodology is presented to the students from the first lecture, it is written in the syllabus of the course, and available also to the course's e-class web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Kerzner, H. (2017), " Project Management: A Systems Approach to Planning, Scheduling, and Controlling ", 11 η edition, Wiley.
Burke, R. (2014), "Project Management Leadership: Building Creative Teams¨ 2nd Edition, Wiley.
Πολύζος, Σ. (2011). Διοίκηση και Διαχείριση Έργων, Μέθοδοι και Τεχνικές , 2 η Έκδοση, Εκδόσεις ΚΡΙΤΙΚΗ, Αθήνα.
Δημητριάδης, Α. (2004) Διοίκηση - Διαχείριση Έργου - Project Management, εκδόσεις Νέων Τεχνολογιών, Αθήνα.
Πολύζος, Σ. (2004) Διοίκηση και Διαχείριση των Έργων – Μέθοδοι και Τεχνικές, εκδόσεις Κριτική.
Γωνιάδης, Η. (2016), Επιχειρηματικότητα, οικονομική ανάπτυξη και κοινωνική ευημερία", Εκδόσεις Διπλογραφία, Αθήνα

COURSE OUTLINE Management and Business Administration

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	605D	SEMESTER	6
COURSE TITLE	Management and Business Administration		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Exercises	1	

COURSE TYPE	General background
PREREQUISITE COURSES:	

LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://www.dit.uoi.gr/e-class/courses/uoi605D/

LEARNING OUTCOMES

Learning outcomes
Successful completion of the course will enable students to: Understand the principles of business organization and management, as well as familiarize themselves with the company's internal and external environment. Familiarize with the historical evolution of management with its actors, role of management, and the principles of scientific management. Understand the basic concepts of functional and strategic planning and programming. Identify the jobs in a business, plan the departments, coordinate the organization, know about the modern trends in organizational structures and the criteria for assessing the effectiveness of the organization. Familiarize themselves with the key components of business leadership, notably by analyzing business operations on leadership and motivation issues. Acquire basic knowledge about human resource management, business communication, and team building. Know the administrative function as a follow-up of activities to ensure that they are implemented in accordance with the planning and at the same time to remedy any significant deviation. Understand Total Quality Management and its importance in today's business. Be informed about entrepreneurship and how to create - steps of a business plan, what points and how they are approached by the business.
General Competences
Organizational and management skills Adapt to new situations. Decision making. Autonomous work. Teamwork. Design and project management. Exercise of criticism and self-criticism. Promoting free, creative and inductive thinking.

SYLLABUS

Definition of the organization, ways of approaching corporate bodies, business as an economic unit. Basic principles of management, definition of management, 4 management functions, evolution of management theory, historical management review, scientific administration. Programming, what is programming, types of programs, management process with goals, strategy and policies. What is organization, what is organizational planning, organization chart, segmentation, job design, organizational structures, assignment of responsibilities. Leadership, theory of leadership traits, leadership functions, leadership features, leadership styles, differences between manager and leader, incitement and motivation. What is control, the control process, types and levels of control, control steps. Introduction to project management. In the context of the course, students participate in a business game, where they are called to form founders' teams and develop and promote an innovative business idea to a business angel.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	☒ Electronic, slide-oriented, presentations uploaded to e-class, ☐ Use of software during lecture, ☒ Use of specialized software, ☒ Electronic educational material available to e-class,

<table>
<tr><td></td><td>☒ Management of projects / exercises via website,
☒ Communication with students via e-mail.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39 hours</td></tr>
<tr><td>Project</td><td>23 hours</td></tr>
<tr><td>Exercises</td><td>13 hours</td></tr>
<tr><td>Non-directed study</td><td>50 hours</td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Evaluation: Greek language (English for Erasmus students).
According to the course's syllabus, students should deliver a project, which will form the basis for their evaluation. Projects and presentations can be delivered in Greek or English language. The final grade of the course will come up as follows:
50% from the project evaluation and presentation
50% from the oral exam.
The evaluation methodology is presented to the students from the first lecture, it is written in the syllabus of the course, and available also to the course's e-class web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Skripak, Stephen J. (2018). Fundamentals of Business, 2nd Edition, Blacksburg, VA: VT Publishing. http://hdl.handle.net/10919/84848. Licensed with CC BY-NC-SA 4.0 https://creativecommons.org/licenses/by-nc-sa/4.0.
Κέφης, Β. (2005), Ολοκληρωμένο Μάνατζμεντ, βασικές αρχές για σύγχρονες οικονομικές μονάδες, Εκδόσεις Κριτική ΑΕ, Αθήνα.
Μπουραντάς, Δ. (2015), Εισαγωγή στη διοίκηση επιχειρήσεων, Έκδοση Μπένου, Αθήνα.
Bateman and Snell (2017), Διοίκηση επιχειρήσεων, Εκδόσεις Τζόλα, Αθήνα.
Μπουραντάς, Δ. (2015), Μάνατζμεντ, Β΄ Έκδοση, Εκδόσεις Μπένου, Αθήνα.
Πετρίδου, Ε. (2016), Διοίκηση – Μάνατζμεντ: μια εισαγωγική προσέγγιση, Έκδοση Τρίτη, Εκδόσεις Σοφία, Θεσσαλονίκη.
Burke, R. (2014), " Διαχείριση έργου Αρχές και τεχνικές ", εκδόσεις Κριτική, Αθήνα
Γωνιάδης, Η. (2016), Επιχειρηματικότητα, οικονομική ανάπτυξη και κοινωνική ευημερία", Εκδόσεις Διπλογραφία, Αθήνα

COURSE OUTLINE Mathematical Analysis II

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Graduate			
COURSE CODE	101	SEMESTER	1	
COURSE TITLE	Mathematical Analysis II			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			4	5
Exercises			1	
COURSE TYPE	general background			
PREREQUISITE COURSES:	There are no required prerequisite courses. However, it is advisable that the student has successfully completed the courses “Mathematical Analysis” in past semesters.			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/			

LEARNING OUTCOMES

Learning outcomes
After completing the course, students will be able to Perform basic operation of multivariate calculus e.g. find partial derivatives and use them to interpret the manner in which a function varies with respect to its arguments, find the gradient and the directional derivative of a function at a given location. Compute derivatives using the chain rule or total differentials. Set up and solve optimization problems involving several variables, with or without constraints. Understanding of line integrals for work and flux, surface integrals for flux, general surface integrals and volume integrals. Also, an understanding of the physical interpretation of these integrals. Set up and compute multiple integrals in rectangular, polar, cylindrical and spherical coordinates. Change variables in multiple integrals. Understanding of the major theorems (Green's, Stokes', Gauss') of the course and of some physical applications of these theorems. Handle vectors fluently in solving problems involving the geometry of lines, curves, planes, and surfaces in space. Model and solve problems appearing in Informatics, such as simple routing cost minimization problems, using tools from multivariate Calculus Explain the basic vocabulary, concepts, rules, definitions, and mathematical notation of differential equation Demonstrate the standard techniques for solving differential equations of first and second order.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Production of free, creative and inductive thinking Development of critical and analytical thinking. Appropriate level of mathematical literacy and competency. Understanding of the mathematical framework that supports engineering, science, and technology.

SYLLABUS

Multivariable Calculus, the gradient, directional derivatives and the Chain Rule; Lagrange multipliers and optimization problems; Double integrals in rectangular and polar coordinates; Triple integrals in rectangular, cylindrical and spherical coordinates;

Vectors, vector actions, dot and cross product, Vector Functions, Gradient, Deviation and Curl.
Fundamental theorem for line integrals and Green's theorem
First order differential equations (Separable and exact variables, linear, homogeneous, precision, Bernoulli and Ricatti).
Linear equations of the second order with fixed coefficients, fundamental and general solutions.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>52 hours</td></tr><tr><td>Exercises</td><td>13 hours</td></tr><tr><td>Study</td><td>60 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	The final results for the course will be: - the final written test is weighting with 70% - the intermediate test with 30% Students must participate in final term exams (70%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

Thomas's Calculus, R. L. Finney, M. D. Weir, F. R. Giordano, 10th (or higher) edition, 2001, Addison-Wesley-Longman
Calculus Vol. II, T. M. Apostol, John Wiley & Sons, 1969.
Vector Calculus, J. Marsden, A. Tromba, W. H. Freeman; Sixth edition (December 16, 2011).
Mathematical methods in the Physical Science, M. Boas, 3rd edition
Μαθηματικά ΙΙ, Θ. Ρασσιάς, β΄ έκδοση, Εκδόσεις Τσότρας, 2017.
Διαφορικός και ολοκληρωτικός λογισμός ΙΙ, Τομ, Αποστολ, Εκδόσεις Ατλαντίς, 1990
Εφαρμοσμένη Ανάλυση και Θεωρία Fourier, Μ.Ε. Φιλιππάκης, Εκδόσεις Τσότρας
Mathematical Methods for Engineers and Scientists 2 [electronic resource], Tang, Kwong-Tin, Heal-Link/Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών

B) Software flow

COURSE OUTLINE Software testing and quality assurance

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	700	SEMESTER	7
COURSE TITLE	Software testing and quality assurance		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory work	1	

COURSE TYPE	special background
PREREQUISITE COURSES:	Suggested courses: Object Oriented Programming, Software Engineering, Parallel and Distributed Systems
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Identification of common mistakes and bad practices that leads to unsafe programs (buffer overflows, memory leakages, malware, etc.) and strategies to avoid them. Ability to organize code reviews. Understanding Test Driven Development and Behavioral Driven Development. Ability to apply code refactoring techniques. Ability to apply debugging techniques. Ability to apply testing strategies. Ability to apply code styles and documentation techniques. Understanding formal specifications, formal specifications models. Ability to use TLA+ in order to develop formal specifications models. Ability to test formal specifications models.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Reading and understanding code. Software verification and validation. Program correctness. Bug types (syntax errors, logic errors, runtime errors). Specifications. Defensive programming (secure coding, exception handling). Code reviews. Basic testing techniques, test-cases. Contracts, pre-condition, post-condition. Unit testing and system testing. Test Driven Development (TDD), Behavioral Driven Development (BDD). Code refactoring. Modern programming environments (code search, using libraries APIs). Debugging, debugging tools. Programming styles. Documentation. Formal specifications. TLA+ for developing formal specifications. Comparison between formal specifications and verification and validation techniques.

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of the course’s webpage that keeps educational material of previous academic years which is updated every year.
Lectures typically use electronic presentations, writing, executing and criticizing segments of code.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory work</td><td>13 hours</td></tr><tr><td>Study</td><td>48 hours</td></tr><tr><td>Project</td><td>25 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Students must complete a project accompanied with a technical report (30%).
Students must participate in final term exams (70%).
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Τεχνολογία λογισμικού, μια πρακτική προσέγγιση, Roger S. Pressman, Bruce R. Maxim, 8η έκδοση – 2018, ISBN: 978-960-418-720-1
Ανάγνωση κώδικα, Διομήδης Σπινέλλης, 2005, Εκδόσεις Κλειδάριθμος, ISBN: 978-960-209-845-7
Ποιότητα κώδικα, Διομήδης Σπινέλλης, 2008, Εκδόσεις Κλειδάριθμος, ISBN: 978-960-461-123-2
Practical TLA+: Planning Driven Development, Hillel Wayne, 2018, Apress, ISBN: 978-148-423-828-8
Specifying Systems: The TLA+ Language and Tools for Hardware and Software Engineers, Leslie Lamport, 2002, Addison-Wesley Professional, ISBN: 978-032-114-306-8
SWEBOK V3.0, Guide to the software engineering body of knowledge, Eds Pierre Bourque, Richard E. Fairley, IEEE Computer Society, ISBN: 978-076-955-166-1
Clean Code: A Handbook of Agile Software Craftsmanship, Robert C. Martin, Prentice Hall, 1st edition – 2008, ISBN: 978-013-235-088-4
- Related academic journals:
IEEE Transactions on Software Engineering
Empirical Software Engineering
ACM Transactions on Software Engineering and Methodology

COURSE OUTLINE Compilers

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	700	SEMESTER	7
COURSE TITLE	Compilers		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	special background		
PREREQUISITE COURSES:	Suggested courses: Principles of Programming Languages		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
The main learning outcome of this course is to pass to the students the technical skill of implementing a simple compiler. Moreover, the course achieves the following outcomes: Understanding the importance of compilers and identification of the role of each compilation phase. Understanding of grammar concepts related to programming languages (regular expressions, production rules). Understanding of descending and ascending syntax analyzers. Fluency of using meta-tools: flex, bison Understanding the role of symbol table and appropriate data structures for implementing it. Understanding of intermediate code production mechanisms, code optimization and target code.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to compilers and interpreters, compilation phases. Fundamentals of typical languages, grammars, automata. Lexical analysis, design of a lexical analyzer, implementation of a lexical analyzer using flex. Syntax analysis, top down syntax analysis, syntax analyzer design, implementation of a syntax analyzer using bison. Symbol tables. Semantic analysis. Intermediate code generation. Code optimization. Target code generation.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code.

	Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory work</td><td>13 hours</td></tr><tr><td>Study</td><td>43 hours</td></tr><tr><td>Project</td><td>30 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	Students must complete a project implementing a small compiler accompanied with a technical report (30%). Students must participate in final term exams (70%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Μεταγλωττιστές, αρχές τεχνικές και εργαλεία, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, 2η έκδοση – 2014, Εκδόσεις Νέων Τεχνολογιών, ISBN: 978-960-6759-72-7
Μεταγλωττιστές, Νικόλαος Σ. Παπασπύρου, Εμμανουήλ. Σ. Σκορδαλάκης, 2002, Εκδόσεις Συμμετρία, ISBN: 978-960-266-135-2
Σχεδίαση και κατασκευή μεταγλωττιστών, Keith D. Cooper, Linda Torzon, 2018, Πανεπιστημιακές Εκδόσεις Κρήτης, ISBN: 978-960-524-519-1
Μεταγλωττιστές, Ζαφείρης Καραϊσκος, 2016, Εκδόσεις da Vinci, ISBN: 978-960-9732-18-5
Μεταγλωττιστές, Μαρία Κ. Βίρβου, 2014, Εκδόσεις Βαρβαρήγου, ISBN 978-960-7996-15-1
Writing Compilers and Interpreters: A Software Engineering Approach, Ronald Mak, 3rd edition – 2009, Wiley, ISBN-13: 978-0470177075
Modern compiler design, Dick Grune, Kees van Reeuwijk, Henri E. Bal, Ceriel J.H. Jacobs, Koen Langendoen, 2nd edition – 2012, ISBN-13: 978-1461446989
Writing a compiler in Go, Thorsten Ball, 2018, ISBN-13: 978-3982016108

COURSE OUTLINE Advanced DataBases II

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE		SEMESTER	7
COURSE TITLE	Advanced Data Bases II		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	specialized general knowledge		
PREREQUISITE COURSES:	Databases I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding of the database design, modeling, and administration and as parts of the development of information systems Deep understanding of the query processing and techniques involved in query optimization. Deep understanding of the principles of storage and indexing structure and recovery management Deep understanding of the Functional Dependency and Functional Decomposition. Familiarization and ability to make a normalized relational database (logical and physical data model) based on a conceptual data model with a CASE tool Familiarization and ability to apply various Normalization techniques Familiarization and ability to master the basic database administration tasks: you are able to specify users and their access rights, and monitor and optimize databases. Familiarization and ability to execute various advance SQL queries related to Transaction Processing.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to Database Management Systems (DBMS), Physical Storage. Architecture of a DBMS. Key Storage Indexing. Tree Index (B-trees, B + trees). Normalization normal forms (1NF, 2NF, 3NF, BCNF, and 4NF), data model validation to insure its completeness , DB Manipulation—Advanced SQL operations, query optimization, Database Recovery Techniques. Distributed databases. Text databases, XML and databases on the Internet. Data Mining Concepts. Emerging Database Technologies and Applications (NoSQL databases, NewSQL databases, Mobile databases, fractals in databases). Future directions

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS</td><td>Use of the course’s webpage that keeps educational material of previous academic years which is updated every year.
Lectures typically use electronic presentations, writing, executing and criticizing segments of code.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39 hours</td></tr>
<tr><td>Laboratory work</td><td>13 hours</td></tr>
<tr><td>fieldwork for project assignment</td><td>10 hours</td></tr>
<tr><td>Project</td><td>25 hours</td></tr>
<tr><td>study and analysis of bibliography</td><td>10 hours</td></tr>
<tr><td>Study</td><td>38 hours</td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Students must complete a project assignment (30%).
Students must participate in final term exams (70%).
Successful delivery of Project assignment is prerequisite for participating to final exam.
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Θεμελιώδεις αρχές συστημάτων βάσεων δεδομένων, Elmasri Ramez,Navathe Shamkant B. Εύδοξος: [12186] Τόμος Α
Θεμελιώδεις αρχές συστημάτων βάσεων δεδομένων, Elmasri Ramez,Navathe Shamkant B. Εύδοξος [12187]:Τόμος Β
Raghu Ramakrishnan: Database Management Systems, McGraw Hill.
Jeffrey Ullman: Principles of database and knowledge-base systems.
Michael Stonebraker, Readings in database systems, Morgan Kaufmann.
Christos Faloutsos, Searching Multimedia Databases by Content, Kluwer Academic Press

- Related academic journals:
ACM Transactions on Database Systems,
IEEE Transactions on Knowledge and Data Engineering
VLDB Journal
Information Systems

COURSE OUTLINE Enterprise Information Systems

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	800	SEMESTER	8
COURSE TITLE	Enterprise Information Systems		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory work	1	

COURSE TYPE	special background
PREREQUISITE COURSES:	none
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://www.dit.uoi.gr/e-class/courses/uoiR1_E1/

LEARNING OUTCOMES

Learning outcomes
Autonomous work
General Competences
Students get theoretical and practical background in business process management and enteprise information systems (ERP, CRM, business intelligence, e-commerce, and e-governance systems).

SYLLABUS

EIS/MIS concepts and classification. ERP systems.
Business processes, business process models, business process management.
Examples of sales, purchasing, materials management, and production planning processes.
Business process performance, business process reengineering.
Key factors driving realization of EIS value: Data and process integration, automation and optimization, decision support. Potential benefits of companies from EIS use.
EIS implementation methods, critical success factors, performance evaluation.
CRM and CRM systems, customer lifecycle, marketing, sales, and service.
E-commerce and e-governance, business models, partners and interaction types, factors driving value and potentila benefits, supporting technologies.
Introduction to business intelligence, concepts and technologies.
Demos: business process modeling, business process reengineering, EIS configuration, production planning with MRP, CRM processes, business intelligence. Case studies of e-commerce and e-governace.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's website, instructor's notes Demos using EIS Students communicate with the instructor using emails and the the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Study	73 hours
Laboratory work	13 hours

	Course total	125 hours
STUDENT PERFORMANCE EVALUATION	Final written exam. Optional instuctor guided home study and presentation on selected topic.	

ATTACHED BIBLIOGRAPHY

Curran T., Ladd A. (2000) “SAP R/3 Business Blueprint”, 2nd edition, Prentice Hall.
Dyché J. (2002) “The CRM Handbook, A business guide to Customer Relationship Management”, Addison-Wesley.
Hopp W.J., Spearman M.L. (2011), "Factory Physics, Foundations of Manufacturing Management, third edition", McGraw-Hill.
Keller G., Teufel T. (1998) "SAP R/3 Process Oriented Implementation", Addision-Wesley Longman.
Kimball, R., Ross, M. (2013) "The Data Warehouse Toolkit, 3rd edition", Wiley.
O’Leary D.E. (2000) "Enterprise Resource Planning Systems: Systems, Life Cycle, Electronic Commenrce, and Risk", Cambridge University Press.
Magal S.R., Word J. (2011) "Integrated Business Processes with ERP Systems", Wiley.
G. Norris, J.R. Hurley, K. M. Hartley, J.R. Dunleavy, J.D. Balls (2000), “E-business and ERP, transforming the enterprise”, John Wiley & Sons.
Scheer A.W. (1999) "ARIS Business Process Modeling" second edition, Springer.
Shanks G., Seddon P.B., Willcocks L.P. (2004) "Second-Wave Enterprise Resource Planning Systems", Cambridge University Press.
Sharda R., Delen D., Turban E. (2017) "Business Intelligence, Analytics, and Data Science, A Managerial Perspective", Pearson.
Teorey, T., Lightstone, S., Nadeau, T., Jagadish, H.V. (2011) “Database Modeling and Design, Logical.Design, 5th edition”, The Morgan Kaufmann Series in Data Management Systems.
Turban E., Outland J., King D., Lee K.L., Liang T.P., Turban D.C. (2018) Electronic Commerce 2018 A Managerial and Social Networks Perspective, ninth edition", Springer.
Balasubramanian, S., and Gupta, M. (2005), “Structural metrics for goal based business process design and evaluation”, Business Process Management Journal, Vol. 11, No. 6, pp. 680-694.
Davenport, T.H., Harris J.G. Cantrell, S. (2004) "Enterprise systems and ongoing process change", Business Process Management Journal, 10(4), pp.16-26
Hammer, M. (2007), “The process audit”, Harvard Business Review, Vol. 85, No. 4, pp. 111-123.

COURSE OUTLINE Parallel and distributed computing

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	800	SEMESTER	8
COURSE TITLE	Parallel and distributed computing		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	special background		
PREREQUISITE COURSES:	Suggested courses: Programming I, Programming II		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://www.dit.uoi.gr/e-class/courses/197/		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding of why parallel computing is important in modern computer systems. Understanding of terminology and technologies that are used in parallel and distributed systems. Developing of parallel programs. Developing of distributed programs. Developing of concurrent programs. Developing of solutions to high performance computing problems. Understanding of the programming model that is used for programming applications that exploit the capabilities of modern Graphical Processing Units (e.g. Nvidia CUDA).
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Parallel and distributed systems architectures. Interconnection networks. Principles of parallel and distributed computations in shared memory systems and in distributed memory systems. Speedup and efficiency in parallel algorithms. Concurrency. Critical sections, mutual exclusion, busy wait, barriers, semaphores, conditional variables. Multithreading programming using pThreads. High level multithreading programming using OpenMP. Distributed memory programming using MPI. Graphical processing units (GPUs) for high performance computing.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year.

	Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Students must complete a project implementing a small compiler accompanied with a technical report (30%). Students must participate in final term exams (70%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

Activity	Semester workload
Lectures	39 hours
Study	48 hours
Laboratory work	13 hours
Programming exercises	25 hours
Course total	125 hours

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Εισαγωγή στον παράλληλο προγραμματισμό, Peter S. Pacheco, 2015, Εκδόσεις Κλειδάριθμος, ISBN 978-960-461-666-4

Προγραμματισμός και αρχιτεκτονική συστημάτων παράλληλης επεξεργασίας, Στέλιος Παπαδάκης, Κώστας Διαμαντάρας, 2012, Εκδόσεις Κλειδάριθμος, ISBN: 978-960-461-446-2

Εισαγωγή στον παράλληλο προγραμματισμό – πρότυπα, αλγόριθμοι, προγραμματισμός, Γραμμάτη Πάντζιου, Βασίλειος Μάμαλης, Αλέξανδρος Τομαράς, 2013, Εκδόσεις Νέων Τεχνολογιών, ISBN 978-960-6759-89-5

Προγραμματισμός σε σύγχρονα υπολογιστικά συστήματα – MPI, OPENMP, PTHREADS, CUDA, Γεώργιος Α. Γραββάνης, Κωνσταντίνος Μ. Γιαννουτάκης, Χρήστος Κ. Παπαδόπουλος-Φιλέλης, 2012, Εκδόσεις Παπασωτηρίου, ISBN: 978-960-491-058-8

MPI θεωρία και εφαρμογές, Αθανάσιος Μάργαρης, 2008, Εκδόσεις Τζιόλλα, ISBN: 978-960-418-145-2

- Related academic journals:

IEEE Transactions on Parallel and Distributed Systems

Journal of Parallel and Distributed Computing

COURSE OUTLINE Computer Graphics

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE		SEMESTER	8th
COURSE TITLE	Computer Graphics		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	yes		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
Students successfully complete the course will: Have understood the basic concepts and algorithms of graphics and the architecture and basic functions of a graphics system. Understand the basic stages of the pipeline for designing and displaying image on the computer (drawing shapes, clipping, hiding, transformations, projections, lighting, texture imaging, shadow creation), and be able to apply corresponding algorithms. Have understood the processes of implementing simple and complex transformations (2D and 3D) and will be able to perform complex transformations Have understood and will be able to apply all of the basic graphics algorithms by making the relevant calculations in 2D and 3D geometry. They can describe the texturing process on surfaces. Being practiced and acquired the ability to develop basic graphics applications using Open GL. They will be able to synthesize a simple 3D scene with motion and simple interaction with the user by using OpenGL.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction. General concepts. Hardware for graphics, Modeling elements of the human communication mechanism Key models of perception and reaction, senses and sensing organs. Libraries for two-dimensional graphics, Filling, antiliasing, cut-out, Geometric transformations in two and three dimensions, Graphical user interface (GUIs). Interactive input methods, Three-dimensional scene projection in two dimensions, projections, observation systems, solid representation. Software packages for the representation and rendering of 3D objects, Representation of curves and surfaces, Color and color models. Lighting and shading, Determination of the visible surfaces of a solid, Virtual reality, Photorealism. Radius Detection. Programming of modern hardware (GPU).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory work	23 hours
Project	13 hours
Study	50 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	The final grade for the course is 60% from the final exam and 40% from the degree of 3 project implementation in OpenGL. During the semester, a written examination (Progress) is made, which is optional and the grade is counted in the written examination. For the success of the exam course, a grade of writing must be at least 50%. The assessment criteria are announced to the students at the first lecture, which are explicitly mentioned in the syllabus of the course, which is also available in the e-class.

ATTACHED BIBLIOGRAPHY

Suggested bibliography:

Γραφικά και Οπτικοποίηση: Αρχές και Αλγόριθμοι, Θεοχάρης Θ., Πλατής Ν., Παπαϊωάννου Γ., Πατρικαλάκης Ν. Εκδόσεις Συμμετρία (2015), 1η Έκδοση, ISBN: 978-960-266-296-0
Γραφικά Υπολογιστών με Opengl, Hearn D., Baker M. P., Εκδόσεις Τζιόλα (2010) ISBN: 978-960-418-257-2
Computer Graphics and Geometric Modeling for Engineers. V. Anand. John Wiley& Sons Inc, 1993, ISBN: 0-471-51417-9.
Computer Graphics, Principles and Practice, J. Foley, A. van Dam, S. K. Feiner, J. F. Hughes. Second Edition in C. Addison Wesley, 1996, ISBN: 0-201-84840-6
Fast Algorithms for 3D-Graphics. G. Glaeser Springer Verlag, 1994, ISBN: 0-387- 94288-2.
. Geometric and Solid Modeling C. M. Hoffmann. Morgan Kaufmann, 1989, ISBN: 1-55860-067-1.
Applied Graphics Algorithms. Marv Luse. Addison Wesley, 1995, ISBN: 0-201-40845-7.
The Data Visualization Toolkit: An ObjectOriented Approach to 3D Graphics. W. Schroeder, K. Martin, B. Lorensen. Prentice Hall, 1996, ISBN: 0-13-199837-4.
3D Computer Graphics, Alan Watt. Third Edition. Addison Wesley, 2000.
OpenGL(R) Programming Guide: The Official Guide to Learning OpenGL(R), Version 2.1 (6th Edition) (OpenGL) by Dave Shreiner , Mason Woo, Jackie Neider, Tom Davis.

Related academic journals:

Computer Graphics Forum, Wiley-Blackwell, the official journal of Eurographics
ACM Transaction on Graphics, ACM

C) Intelligent systems flow

COURSE OUTLINE Data Mining

GENERAL

SCHOOL	Informatics and Telecommunications
ACADEMIC UNIT	Informatics and Telecommunications
LEVEL OF STUDIES	Undergraduate

COURSE CODE	P2_X4	SEMESTER	7
COURSE TITLE	Data Mining		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lecture		3	5
Laboratory exercises		1	
COURSE TYPE	special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://www.dit.uoi.gr/e-class/courses/uoiR2_X4/		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that this course achieves are: Understanding main principles and concepts of processing data and extracting information and knowledge. Understanding methods of data analysis and data exploration using automated and semi-automated methodologies for identifying patterns. Understanding principles and main methodologies for classification, clustering and association rules. Learning to apply algorithms and methods for classification, clustering, and produce association rules Be able to choose the most appropriate data mining technique depending on the nature of the problem and the type of information available. Use and apply the software Waikato Environment for Knowledge Analysis (WEKA).
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction: Models, methodologies and procedures. What is Data Mining and what is not Data Mining? Data: Data types, data quality, data pre-processing and transformation, data visualization. Classification Algorithms: Decision trees (C4.5 algorithm). Clustering The k- means algorithm. Association rules, Apriori algorithm, Frequent itemsets, Extracting Association rules. Case studies. Use WEKA freeware platform to implement data mining algorithms.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.

TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory exercises</td><td>13 hours</td></tr><tr><td>Supporting for Project implementation</td><td>8 hours</td></tr><tr><td>Project implementation</td><td>20 hours</td></tr><tr><td>Study</td><td>45 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION .	Students must complete three (3) programming projects accompanied with a technical report (40%). Students must participate in final term exams (60%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Εισαγωγή στην Εξόρυξη Δεδομένων (2010) P.-N Tan,, M.. Steinbacch and . Kumar. Εκδόσεις A. Τζιόλα & Υιοι

Εξόρυξη Πληροφορίας : Ένας εισαγωγικός οδηγός R. Roiger and M. Geatz (2008). Εκδόσεις Κλειδάριθμος

Data mining (2004). Margaret Dunham Εκδόσεις Νέων Τεχνολογιών

Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten , Morgan Kaufmann Publishers Inc,US 2005

Predictive Data Mining, Morgan Kaufman Publishers, S.M.Weiss, N.Indurkhya, ISBN: 1558604030, 1998.

Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, The Morgan Kaufman Series in Data Management Systems, Jim Gray, Series Editor, Morgan Kaufman Publishers, August 2006.

Pattern Classification (2nd Ed), R.O. Duda, P.E. Hart, D.G. Stork, J Wiley 2000

Principles of Data Mining, D. Hand, H. Mannila, P. Smyth, MIT Press 2001

- Related academic journals:

IEEE Intelligent Systems

IEEE Transactions on Knowledge and Data Engineering

COURSE OUTLINE Optimization

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
COURSE CODE	Graduate		
COURSE CODE		SEMESTER	
COURSE TITLE	Optimization		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Exercises		1	
COURSE TYPE	special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are:

Understanding of optimization problems in many scientific and practical fields.
Implementation of optimization procedures

General Competences
The general competences that are acquired upon completion of the course are:
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Project planning and management
Criticism and self-criticism
Production of free, creative and inductive thinking

SYLLABUS

Introduction to optimization, one dimension optimization, optimization methods withoud derivatives, multistart techniques, Simulated annealing, Differential evoluton, Genetic algorithms, optimization software

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory projects	13 hours
Project	20 hours
Study	53 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Students must complete four p programming projects during the semester (40%). Students must complet a team project (60%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

Βελτιστοποίηση τεχνικών συστημάτων, Άγγελος Πρωτοπαπάς, 2015, Κάλλιπος, ISBN: 978-960-603-493-0
Καθολική βελτιστοποίηση: μέθοδοι λογισμικό και εφαρμογές, Ιωάννης Γ. Τσούλος, διδακτορική διατριβή, εθνικό αρχείο διδακτορικών διατριβών.
Αριθμητικές μέθοδοι βελτιστοποίησης, Ισαάκ Λαγαρής, ιστοσελίδα σημειώσεων διαθέσιμη από http://www.cs.uoi.gr/~lagaris/OPT_UNDER/
Τεχνικές βελτιστοποίησης, Γεώργιος Α. Ροβιθάκης, 2007, εκδόσεις Τζιόλα, ISBN-13: 978-960-418-141-4 .
Μαθηματική θεωρία βελτιστοποίησης , DingZhu Du, Panos M. Pardalos, Weili Wu, 2005, Εκδόσεις Νέων Τεχνολογιών, ISBN 960-8105-79-X, ISBN-13 978-960-8105-79-9
Journals
Computer Physics Communications

Optimization letters, SPRINGER
Siam Journal of optimization.

COURSE OUTLINE Computational Intelligence

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE		SEMESTER	7
COURSE TITLE	Computational Intelligence		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	Special background		
PREREQUISITE COURSES:	Mathematical Analysis I & II, Linear Algebra Suggested courses: Probabilities and Statistics, Programming, Signals and Systems		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	English		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
The aim of the course is to introduce the students to computational intelligence techniques, such as Artificial Neural Networks (ANNs), Evolutionary Algorithms and Fuzzy Logic, but also combinations of them for solving problems in a wide range of applications. The main objective is the student's comprehension of basic concepts of computational intelligence with particular emphasis on artificial neural networks and evolutionary calculations. This objective consists of both a theoretical and a practical part. The acquisition of the appropriate theoretical concepts aims at enhancing the students' cognitive background with the mathematical concepts necessary to understand the different computational models. The practical part, as a continuation of the theoretical one, aims at developing skills of understanding and applying mathematical models of computation to real system modeling problems. From a more general point of view, the course aims at creating the computational and mathematical "maturity" of the students and help with their initiation into research. Upon successful completion the students should be able to: Understand the nature of problems that can be solved using computational intelligence methods and techniques. Recognize and apply the concepts, the basic terminology and the methodology of the computational techniques and algorithms used to solve problems with computational intelligence. Implement basic algorithms of the artificial neural networks and evolutionary computing. Evaluate the problems that can be solved by ANNs or evolutionary algorithms. Choose and use the appropriate computing tool to solve the problems that arise. Be aware of the basic concepts of Fuzzy Logic. Use Fuzzy Logic in combination with other computational intelligence and machine learning techniques. Perform effective bibliographic research linking open problems with literature. Identify and distinguish between research issues and implementation problems.
General Competences
The general competences that are acquired upon completion of the course are: Production of free, creative and inductive thinking Search for, analysis and synthesis of data and information, with the use of the necessary technology Developing and documenting arguments using structured mathematical thinking

Combined analysis of methods for problem solving
Decision making
Generating new research ideas

SYLLABUS

Section 1. Introduction and Basic Concepts
Introduction to computational intelligence.
Relation with classic (symbolic) artificial intelligence
Applications: types and examples of problems formulated with symbolic or/and numerical terms.

Section 2. Artificial Neural Networks (ANN)
Basic concepts of ANN. Biological and artificial neurons. Structure, basic operation, stimulation and activation function of a neuron.
Training methods and learning in ANNs. Supervised and unsupervised learning. Reinforcement learning.
Linear and non linear classifiers. Single layer and multi layer percetrons.
Hebb's rule.
Delta rule and error back-propagation.
Radial basis function neural networks.
Learning vector quantization and Kohonen's self-organizing maps.
Applications of ANNs.

Section 3. Evolutionary Computing and algorithms
Principles and mechanisms of evolutionary computing.
Categories of evolutionary algorithms: genetic algorithm and ιτ'σ different versions, evolutionary strategies, evolutionary programming, genetic programming, grammatical evolution.
Algorithms based on social behavior of a population and swarm intelligence.
Particle swarm optimization. Algorithms and applications.
Other evolutionary computing models: differential-evolution algorithm ant colony optimization, memetic algorithms, etc.
Applications.

Section 4. Fuzzy Logic
Reminder of basic concepts of fuzzy logic. Fuzzy sets and operations. Fuzzy numbers. Linguistic variables. Support functions. Fuzzy expressions. Fuzzy rules. Fuzzy reasoning. Fuzzification and de-fuzzification.
Relationship with other uncertainty handling techniques. Fuzzy lattices. Fuzzy reasoning on lattices.
Relationship with formal concept analysis.
Use of fuzzy logic in combination with other computational intelligence and machine learning techniques.

Section 5. Applications and use of the methods
Examples of combined use of computational intelligence techniques
Application of computational intelligence methods in real world problems.
Relationship with machine learning. The algorithms k-Nearest Neighbor and k-Means.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY s	Use of electronic (slide) presentations posted on the e-class platform. Use of software for demonstration purposes during lectures. Use of specialized software. Educational material is posted on the e-class platform. Students communicate with the instructor using emails and the discussion forum of the course provided by the e-class platform.

TEACHING METHODS

Activity	Semester workload
Lectures	39 hours
Supervision for essay writing, project development	8 hours
Laboratory work	13 hours
Essay writing, project development	20 hours
Study	45 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION

Examinations are conducted in Greek.

Final written examination with questions for developing arguments, problem solving and exercises. (50%)
Essay on a specific topic with oral presentation, or study of a method with algorithm implementation and presentation of its application. (50%)

Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Κ. Διαμαντάρας, Τεχνητά νευρωνικά δίκτυα, Εκδόσεις ΚΛΕΙΔΑΡΙΘΜΟΣ, Αθήνα, 2007.
Β. Γ. Καμπουρλάζος, Γ. Α. Παπακώστας, Εισαγωγή στην ΥΠΟΛΟΓΙΣΤΙΚΗ ΝΟΗΜΟΣΥΝΗ, ΚΑΛΛΙΠΟΣ, 2015.
S. Haykin, ΝΕΥΡΩΝΙΚΑ ΔΙΚΤΥΑ ΚΑΙ ΜΗΧΑΝΙΚΗ ΜΑΘΗΣΗ, Εκδόσεις ΠΑΠΑΣΩΤΗΡΙΟΥ, Αθήνα, 2017.
M.H. Hassoun, Fundamentals of Artificial Neural Networks, MIT Press Cambridge, MA, U.S.A., 1995.
David B. Fogel, Evolutionary Computation: Toward a New Philosophy of Machine Intelligence, John Wiley & Sons Inc, 2006.
K.E. Parsopoulos and M.N. Vrahatis, Particle Swarm Optimization and Intelligence: Advances and Applications, Information Science Publishing (IGI Global), Hershey, PA, U.S.A., 2010.
R. Haupt and S.E. Haupt, Practical Genetic Algorithms, John Wiley & Sons Inc, 2004.
Ρ-Ε. Κινγκ, Υπολογιστική Νοημοσύνη Στον Έλεγχο Συστημάτων, Εκδόσεις Τραυλός, 1998.

- Related academic journals:

Neural Networks, Journal - Elsevier.
IEEE Transactions on Evolutionary Computation.
IEEE Transactions on Fuzzy Systems.
IEEE Transactions on Neural Networks and Learning Systems.

COURSE OUTLINE Computer Vision

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE		SEMESTER	8th
COURSE TITLE	Computer Vision		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	yes		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
Students successfully complete the course: Can describe the problem of understanding 3D world using 2D images. Be familiar with the theoretical and practical aspects of calculations with data from images. Can describe the formation and recording of the 2D image and all the correlated sizes. Will be able to implement methods for extracting features from images. Will know how to implement different algorithms of image overlay, motion recognition and tracking.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introductory concepts, Elementary image processing (pixel, point transformations, convolution, non-linear filters). Segmentation of objects in images (active contours, mean shift, graphical techniques) and video Image processing based on partial differential equations 2D motion (visual flow, moving objects, eg Lukas-Kanade, Meanshift, Kalman) Parameter estimation, RANSAC) Geometric image transformations (affine, projection, elastic transformations), spatial 3D image matching Visualization (surface / volume rendering from 3D images, image fusion) Image Descriptors (texture, hand and Jacobian) Image descriptors, Search Points of Interest in images (Harris, SHIFT, SURF), Pattern recognition in images Camera Calibration (pinhole model, special wide-angle cameras). Applications: extraction of 3D information from images, mono-optical, dual-vision, shape from silhouettes Prerequisite Knowledge Analysis, Numerical analysis, Linear algebra, programming in Matlab and other languages.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory work</td><td>13 hours</td></tr><tr><td>Study</td><td>6 hours</td></tr><tr><td>Project</td><td>24 hours</td></tr><tr><td>Self-study</td><td>43 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other Specifically-defined evaluation criteria are given, and if and where they are accessible to students.	The final grade for the course is 60% from the final exam and 40% from the degree of 3 project implementation in OpenGL. During the semester, a written examination (Progress) is made, which is optional and the grade is counted in the written examination. For the success of the exam course, a grade of writing must be at least 50%. The assessment criteria are announced to the students at the first lecture, which are explicitly mentioned in the syllabus of the course, which is also available in the e-class.

ATTACHED BIBLIOGRAPHY

Suggested bibliography:

Ψηφιακή Επεξεργασία και Ανάλυση Εικόνας, Νικόλαος Παπαμάρκος, ΑΦΟΙ ΠΑΠΑΜΑΡΚΟΥ Ο.Ε., 3η/2013, ΑΘΗΝΑ, 68372511

Ψηφιακή Επεξεργασία Εικόνας, 4η Έκδοση, Gonzales, Στέφανος Κόλλιας (επιμέλεια), "ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.", 4η/2018, ΘΕΣ/ΝΙΚΗ, 68384821

ΨΗΦΙΑΚΗ ΕΠΕΞΕΡΓΑΣΙΑ ΕΙΚΟΝΑΣ, ΙΩΑΝΝΗΣ ΠΗΤΑΣ, "Ε.&Δ.ΑΝΙΚΟΥΛΑ-Ι.ΑΛΕΞΙΚΟΣ ΟΕ", 4η/2010, 68398652

Επεξεργασία Ψηφιακών Εικόνων, Αναγνωστόπουλος Χρήστος Νικόλαος, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε., 1η/2017, ΘΕΣ/ΝΙΚΗ, 68374176

D. Forsyth and J. Ponce. Computer Vision: a Modern Approach. Prentice Hall, second edition, 2011.

S. Prince, Computer Vision: Models, Learning and Inference, Cambridge University Press, 2012.

COURSE OUTLINE Intelligent Systems based on Knowledge

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	P2_E5	SEMESTER	8
COURSE TITLE	Intelligent Systems based on Knowledge		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lecture	4	5

Laboratory exercises	1	
COURSE TYPE	special background	
PREREQUISITE COURSES:		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek	
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes	
COURSE WEBSITE (URL)	https://www.dit.uoi.gr/e-class/courses/uoiR2_E5/	

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that this course achieves are: Understanding main concepts for Knowledge Representation, Reasoning and knowledge elicitation. Understanding Knowledge Technology and knowledge acquisition methods. Understanding principles of Fuzzy Logic and Fuzzy Systems. Students will be able to design and implement a knowledge based system and an expert system.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction, principles of Knowledge-based Intelligent Systems, principles for knowledge representation (Frames, Sematic Networks, Rules). Structure and Functionality of Knowledge based Systems. Knowledge-Based Technology, Expert Systems based on rules. Forward and Backward chaining, MYCIN, Crtainty Factor. Advanced Reasoning (Model Based Reasoning, Qualitative Reasoning, Cases Based Reasoning) Fuzzy Logic, Fuzzy Sets, Membership Functions, Fuzzy Reasoning, Fuzzy Systems Design. Design and developing project using CLIPS / CLOS / JESS .

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory exercises	13 hours
Supporting for Project implementation	8 hours
Project implementation	20 hours
Study	45 hours

	Course total	125 hours
STUDENT PERFORMANCE EVALUATION .	Students must complete three (3) programming projects accompanied with a technical report (40%). Students must participate in final term exams (60%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Τεχνητή Νοημοσύνη: Αρχές και Εφαρμογές για την Ανάπτυξη Συστημάτων με Τεχνολογίες Νοημοσύνης. Michael Negnevitsky, Εκδόσεις Τζιόλα 2018, ISBN 978-960-418-719-5

Υπολογιστική Νοημοσύνη & Ευφυείς Πράκτορες. Λ. Ηλιάδης, Α. Παπαλεωνίδας, Εκδόσεις Τζιόλα 2017, ISBN 978-960-418-601-3

Τεχνητή Νοημοσύνη, Ι. Βλαχάβας, Π. Κεφαλάς, Ν. Βασιλειάδης, Φ. Κόκκορας, Η. Σακελλαρίου, Γ' Έκδοση, Εκδόσεις Πανεπιστημίου Μακεδονίας, 2011, ISBN: 978-960-8396-64-7

Υπολογιστική Νοημοσύνη και Εφαρμογές, Ι. Μπούταλης, Γ. Συρακούλης, Εκδόσεις: Γ. ΣΥΡΑΚΟΥΛΗΣ, 2010, ISBN: 978-960-93-2008-5

Εισαγωγή στην Ασαφή Λογική (Fuzzy Logic)», Γ. Θεοδώρου, Εκδόσεις: ΤΖΙΟΛΑ, 2010, ISBN: 978-960-418-218-3.

Introduction to Expert Systems, Jackson P., 3rd edition, Addison Wesley, ISBN 0-201-87686-8

Introduction to Knowledge Systems, Stefik M., Morgan Kaufmann, ISBN 1-55860-166-X

- Related academic journals:

IEEE Intelligent Systems

IEEE Transactions on Knowledge and Data Engineering

IEEE Transactions on Fuzzy Systems

COURSE OUTLINE Deep Learning Neural Networks

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE		SEMESTER	8th
COURSE TITLE	Deep Learning Neural Networks		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	yes		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
Students successfully complete the course will have understood: Deep learning models and algorithms that allow computers to learn from complex data. Deep convolutional neural networks, recursive neural networks, stochastic training algorithms from large scale datasets. Unsupervised deep learning techniques using automatic encoders. Techniques of deep learning with applications in robotics and automatic learning of games.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Models and deep learning algorithms that allow computers to learn from complex data. Deep convolutional neural networks, recursive neural networks, stochastic training algorithms from large-scale data sets. Unsupervised deep learning techniques using automatic encoders. Deep Learning Techniques with robotic and automatic gaming applications.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload

	Lectures	39 hours
	Laboratory work	13 hours
	Study	8 hours
	Project	25 hours
	Self-study	40 hours
	Course total	125 hours
STUDENT PERFORMANCE EVALUATION	The final grade for the course is 60% from the final exam and 40% from the degree of 3 project implementation in OpenGL. During the semester, a written examination (Progress) is made, which is optional and the grade is counted in the written examination. For the success of the exam course, a grade of writing must be at least 50%. The assessment criteria are announced to the students at the first lecture, which are explicitly mentioned in the syllabus of the course, which is also available in the e-class.	

ATTACHED BIBLIOGRAPHY

Suggested bibliography:
Ian Goodfellow and Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.
Michael Nielsen, Neural Networks and Deep Learning, MIT Press, 2016.
François Chollet, Deep Learning with python, Manning Publications Company, 2017

D) System design flow

COURSE OUTLINE VLSI Design

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	700	SEMESTER	7
COURSE TITLE	VLSI Design		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory work	1	

COURSE TYPE	Special background
PREREQUISITE COURSES:	Digital Electronics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
Successful completion of the course will enable students to: Describe complex digital systems using HDL. Design complex digital circuits and systems, using specialized tools, cell libraries and complex combinational and sequential structures (e.g. decoders, multiplexers, adders, registers, etc), Design Finite State Machines (FSMs), Design simple processors, Verify a digital system via testbenches using simulators
General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Production of free, creative and inductive thinking, Working independently, Production of new research ideas.

SYLLABUS

VLSI design methodology, circuit modelling using HDL, design of logical functions, design of basic combinational circuits, design of basic sequential circuits, design of FSMs, design of complex systems such as processors.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	☒ Electronic, slide-oriented, presentations uploaded to e-class, ☒ Use of software during lecture, ☒ Use of specialized software, ☒ Electronic educational material available to e-class, ☒ Management of projects / exercises via website, ☒ Communication with students via e-mail.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory practice	13 hours
Projects	13 hours
Non-directed study	60 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Language of Evaluation: Greek language. The final grade of the course will come up as follows: 30% from the grade of the 1st project, 70% from the grade of the 2nd project. Laboratory practice is obligatory. In this framework, and according to the course's syllabus, students should write three (3) reports. The reports are evaluated with the PASS / FAIL criterion. "FAIL" means that the report has to be written and submitted again. "PASS" means that students can proceed to the next report. After the successful completion of the laboratory practice, the 1st and the 2nd project are assigned to students. The final grade should be greater than (50/100) for successful completion of the course. The evaluation methodology is presented to the students from the first lecture, it is written in the syllabus of the course, and available also to the course's e-class web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Circuit Design with VHDL, V. Pedroni, 1st Edition – 2008, Klidarithmos Inc., ISBN: 978-960-461-118-8

Computer Organization and design: The hardware/software interface, David A. Patterson, John L. Hennessy, 4th Edition – 2010, Klidarithmos Inc., ISBN: 978-960-461-353-3

Fundamentals of Digital Logic with VHDL Design, S. Brown and Z. Vranesic, 3rd Edition – 2011, Tziollas Inc., ISBN: 978-960-418-340-1

- Related academic journals:

Transactions on Computer Aided Design (TCAD), IEEE.

Transactions on VLSI Circuits and Systems (TVLSI), IEEE

COURSE OUTLINE Internet of Things

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	714	SEMESTER	7
COURSE TITLE	Internet of Things		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	Special background		
PREREQUISITE COURSES:	Computer Networks		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
Successful completion of the course will enable students to: Understand the concepts, terminology and ecosystem of the Internet of Objects (IoT), Understand the concept of communication between computing objects (m2m communication), Identify and explain the basic features and functions of IOT devices, Distinguish and explain the basic features of the IOT protocols Distinguish and explain IoT service and application features Design and develop simple IoT applications Describe the features and challenges of large volume data Identify trends and future developments in IoT.
General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Working independently, Teamwork, Enabling free, creative and productive thinking.

SYLLABUS

Analysis of the features and characteristics of the internet of things, with emphasis on data handling, management and analysis at application level.
Communications protocols and data management protocols used in IoT
Structure and operation of an established communication standard (MQTT).
Approaches to the standardization of the application development environment (IoT platforms)
Challenges and risks from the massiveness and vulnerabilities of IoT.
In the context of assignments, students are challenged to program subsystems (IoT nodes). Further, the semester assignment aims to the collaborative creation of a full IoT application.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	☒ Electronic, slide-oriented, presentations uploaded to e-class, ☐ Use of software during lecture, ☒ Use of specialized software, ☒ Electronic educational material available to e-class,

<table>
<tr><td></td><td>☒ Management of projects / exercises via website,
☒ Communication with students via e-mail.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39 hours</td></tr>
<tr><td>Laboratory practice</td><td>13 hours</td></tr>
<tr><td>Projects</td><td>25 hours</td></tr>
<tr><td>Non-directed study</td><td>48 hours</td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Evaluation: Greek language (English for Erasmus students).
The final grade of the course will come up as follows:
50% from the aggregate grade of the projects/assignments,
50% from the semester exams.
Students are required to deliver a group (two-person) semester assignment, which is the basis for their assessment. The work is about solving specific problems and / or delving into scientific or techno-economic aspects of the Internet of the Things.
To obtain a pass grade, a student must deliver original assignment and be successfully examined during the final examination (presentation and oral support of the assignment).
The evaluation methodology is presented to the students from the first lecture, it is written in the syllabus of the course, and available also to the course’s e-class web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
B. Arshdeep and M. Vijay, “Internet of Things: A Hands-On Approach”, ISBN 978-0-99602-552-2
David Hanes et all, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, ISBN 978-0-13430-709-1
V. Karagiannis, P. Chatzimisios, F. Vazquez-Gallego and J. Alonso-Zarate, “A Survey on Application Layer Protocols for the Internet of Things”, Transactions on Internet of Things and Cloud Computing, vol. 1, no. 1, January 2015 (https://pdfs.semanticscholar.org/ca6c/da8049b037a4a05d27d5be979767a5b802bd.pdf)
P. Waher, “Learning Internet of Things”, ISBN 978-1-78355-353-2
Building Internet of Things with the Arduino, Charalampos Doukas, ISBN 1470023431
- Related academic journals:
IEEE Internet of Things Initiative https://iot.ieee.org/ και https://standards.ieee.org/initiatives/iot/index.html
IEEE Internet of Things Journal (http://ieee-iotj.org/)

COURSE OUTLINE Advanced Issues of Computer Architecture

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	800	SEMESTER	8
COURSE TITLE	Advanced Issues of Computer Architecture		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory work	1	

COURSE TYPE	Special background
PREREQUISITE COURSES:	Computer Architecture
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
Successful completion of the course will enable students to: Learn and understand the quantitative principles of computer design, Understand and analyse advanced optimization methods related to memory hierarchy, Understand and analyse principles and advanced issues related to instruction-level parallelism, Understand and analyse principles and advanced issues related to data-level parallelism, Understand and analyse principles and advanced issues related to thread-level parallelism, Understand and analyse multicore architectures, Understand architectures of computer systems that exploit request- and data- level parallelism.
General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Production of free, creative and inductive thinking, Group Working Working independently, Production of new research ideas.

SYLLABUS

Quantitative principles of computer design, memory technology and optimizations, principles and advanced issues on instruction-level parallelism, principles and advanced issues on data-level parallelism, principles and advanced issues on thread-level parallelism, warehouse-scale computers.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	☒ Electronic, slide-oriented, presentations uploaded to e-class, ☒ Use of specialized software, ☒ Electronic educational material available to e-class, ☒ Management of projects / exercises via website, ☒ Communication with students via e-mail.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory work	13 hours
Projects	23 hours

	Non-directed study	50 hours
	Course total	125 hours
STUDENT PERFORMANCE EVALUATION	Language of Evaluation: Greek language. The final grade of the course will come up as follows: 50% from the final exam, 50% from Projects, Students should submit three (3) reports. The grade of each report should be greater than (50/100). In case of a report failure, students cannot proceed to the final exam. The final grade of the course should be greater than (50/100) for successful completion of the course. The evaluation methodology is presented to the students from the first lecture, it is written in the syllabus of the course, and available also to the course's e-class web page.	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Computer Architecture: A Quantitative Approach, John L. Hennessy and David A. Patterson, 5th Edition - 2012, Elsevier Inc., ISBN: 978-0-12-383872-8
Computer Architecture and Organization, Stallings William, 10th Edition 2016, TZIOLLAS inc.,

COURSE OUTLINE Sensor networks

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	816	SEMESTER	8 (6)
COURSE TITLE	Sensor networks		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		4	5
Exercises		1	
COURSE TYPE	Special background		
PREREQUISITE COURSES:	Computer Architecture, Protocols and network architecture		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
Successful completion of the course will enable students to: Understand the concepts, terminology and ecosystem of sensor and actuator networks, Identify the basic building blocks of a sensor and actuator network Understand sensor networks as basic (structural) components of the internet of things, Understand the process of capturing requirements and compiling specifications of a sensor network, Understand design constraints arising from non-functional requirements, Understand the properties, functions and techno-economic particularities of embedded and networked sensing and activation systems (motes), Understand the structure of communication protocols between motes and / or gateways, Understand modelling and simulating a sensor network, Analyse sensor networks based on specific networking protocols.
General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Working independently, Teamwork, Enabling free, creative and productive thinking.

SYLLABUS

Characteristics and intricacies of sensor networks (independently and as components of the internet of things). Sensor network communications protocols; Structure and operation of a standard wireless sensor networking protocol (zigbee). Issues on hardware and software of the sensor nodes. Sensor network simulation topics. In the context of laboratory assignments, students use a simulation environment to study and simulate wireless sensor networks.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	☒ Electronic, slide-oriented, presentations uploaded to e-class, ☐ Use of software during lecture, ☒ Use of specialized software,

	☒ Electronic educational material available to e-class, ☒ Management of projects / exercises via website, ☒ Communication with students via e-mail.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory work	13 hours
Assignments	20 hours
Non-directed study	53 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Language of Evaluation: Greek language (English for Erasmus students). The final grade of the course will come up as follows: 50% from the aggregate grade of the projects, 50% from the semester exams. In this framework, and according to the course's syllabus, students should deliver a small number of projects (up to 4) which will form the basis for their evaluation. In order to obtain a pass grade, students must deliver at least 50% of the assigned projects and be successfully evaluated. The evaluation methodology is presented to the students from the first lecture, it is written in the syllabus of the course, and available also to the course's e-class web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
KAZEM SOHRABY et. All: WIRELESS SENSOR NETWORKS: Technology, Protocols, and Applications ISBN: 978-0-471-74300-2
Karl Holger: Protocols and architectures for wireless sensor networks ISBN: 978-0-470-09510-2
Καλοβρέκτης Κ και Κατέβας Ν.: ΑΙΣΘΗΤΗΡΕΣ ΜΕΤΡΗΣΗΣ ΚΑΙ ΕΛΕΓΧΟΥ ISBN: 978-960-418-758-4
Chonggang et. All (Editors): ZigBee Network Protocols and applications ISBN: 978-1-4398-1602-8
Building Internet of Things with the Arduino, Charalampos Doukas, ISBN 1470023431
- Related academic journals:
IEEE Sensors Journal (https://ieeexplore.ieee.org/servlet/opac?punumber=7361)
IEEE Internet of Things Journal (http://ieee-iotj.org/)
IET Wireless Sensor Systems (https://ieeexplore.ieee.org/servlet/opac?punumber=5704589)

COURSE OUTLINE CMOS ASIC Design Techniques

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	800	SEMESTER	8
COURSE TITLE	CMOS ASIC Design Techniques		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	2	5
Laboratory work	2	

COURSE TYPE	Special background
PREREQUISITE COURSES:	Digital Electronics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
Successful completion of the course will enable students to: Understand, design and verify libraries of simple and complex CMOS gates, Optimize the design of simple and complex CMOS circuits in terms of delay, power consumption and required surface on chip, To implement the layout (hierarchical design) of a CMOS ASIC, To understand manufacturing test methodologies.
General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Production of free, creative and inductive thinking, Working independently, Production of new research ideas.

SYLLABUS

Logical and physical design of ASICs, delay, power, interconnection, testing, performance optimizations.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	☒ Electronic, slide-oriented, presentations uploaded to e-class, ☒ Use of software during lecture, ☒ Use of specialized software, ☒ Electronic educational material available to e-class, ☒ Management of projects / exercises via website, ☒ Communication with students via e-mail.
TEACHING METHODS	

Activity	Semester workload
Lectures	26 hours
Laboratory practice	26 hours
Projects	13 hours
Non-directed study	60 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Language of Evaluation: Greek language. The final grade of the course will come up as follows: 50% from the final exam, 20% from the intermediate exam, 30% from the grade of the laboratory practice. The grade of the laboratory practice will come up as follows: 20% from the 1st Project, 35% from the 2nd Project, 45% from the 3rd Project. Laboratory practice is obligatory. In this framework, and according to the course's syllabus, students should write two (2) reports. The reports are evaluated with the PASS / FAIL criterion. "FAIL" means that the report has to be written and submitted again. "PASS" means that students can proceed to the next report. After the successful completion of the laboratory practice, the three projects can be assigned to students. The final grade of the course should be greater than (50/100) for successful completion of the course. The evaluation methodology is presented to the students from the first lecture, it is written in the syllabus of the course, and available also to the course's e-class web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
CMOS VLSI Design: A circuits and systems perspective, N. Weste, D. Harris, 4th Edition – 2011, PAPASOTIRIOU Inc., ISBN: 978-960-718-267-8,
CMOS Digital Integrated Circuits Analysis & Design, Kang Sung - Mo (Steve), Leblebici Yusuf, 3rd Edition - 2007, TZIOLLAS Inc., ISBN: 978-960-418-136-0,
CMOS Circuit Design, Layout, and Simulation, R. Jacob Baker, 3rd edition – 2010, John Wiley & Sons, Inc, ISBN: 978-0-470-88132-3.
- Related academic journals:
Transactions on Computer Aided Design (TCAD), IEEE.
Transactions on VLSI Circuits and Systems (TVLSI), IEEE

E) Biomedicine technology flow

COURSE OUTLINE «BIOMEDICAL ENGINEERING»

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	700	SEMESTER	7
COURSE TITLE	Biomedical Engineering		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory work	1	

COURSE TYPE	Special Background
PREREQUISITE COURSES:	Suggested courses: Signals & Systems, Digital Signal Processing
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course, the student has advanced knowledge in the subject of Biomedical Technology, on the basis of which he / she is able to: Understand, describe and categorizes key technologies used in Biomedical, with diagrams and data. Understand and explain with charts the basic physical laws used in each biomedical entity or modality. Understand, evaluate comparatively and substantiate the relative advantages and disadvantages of alternative technology approaches and solutions. Analyze and interpret the technical features of biomedical equipment; Select the appropriate among the alternative descriptions of the digital system, based on the problem it faces. Acquire basic knowledge and background concepts for the applications of natural sciences in medicine. Understand the main concepts and related mathematical methods. Obtain the ability to develop simple source code in a Matlab environment for Biomedical applications, processing and analysis. Analyze problems and applications of Biomedicine on the physical principles and phenomena on which they are based. Collaborate in a team for the integrated approach (analysis and synthesis) of complex problems of Biomedical Technology, the critical evaluation of alternatives and the decision making to be implemented.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

The content of the course is divided into two distinct sections - parts. In the first part are introduced introductory and fundamental issues related to basic topics of Biomedical Technology while in the second part are presented basic biomedical signals and their properties, as well as their processing techniques that have been presented in the international bibliography.
The structure of the course is:
Part I: Basic Biomedical Technology Topics
Introduction to Biomedical Technology
Medical Data and Standard
Information Systems in Medicine
Telemedicine
Mobile Health
Decision Support Systems in Medicine
Part II: Biomedical Signal Processing
Biomedical Signals
Electrocardiogram
Heart Rate Variability
Electroencephalography
Electromyography
Fetal Electrocardiogram
Human movement analysis

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided into groups and perform laboratory exercises in a computer laboratory equipped with special software and are on the processing and analysis of biomedical signals. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory practice</td><td>13 hours</td></tr><tr><td>Project</td><td>33 hours</td></tr><tr><td>Study</td><td>40 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	Written final exam (70%) which includes: Multiple Choice Exams. Short answer questions. Effective Problem solving. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page. Laboratory work (30%) that includes: Students must complete Projects for 11 thematic topics. All projects are submitted through e-class, and students have access to the corrections and scores of each project.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Τσιπούρας, Μ., Γιαννακέας, Ν., Καρβούνης, Ε., Τζάλλας, Α., 2015. Ιατρική πληροφορική. [ηλεκτρ. βιβλ.] Αθήνα:Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Διαθέσιμο στο: http://hdl.handle.net/11419/2975
Αγγελίδης, Π., 2015. Ηλεκτρονική Υγεία. [ηλεκτρ. βιβλ.] Αθήνα:Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Διαθέσιμο στο: http://hdl.handle.net/11419/5994
Βεντούρας, Ε., 2015. Τεχνολογία της in-vivo διαγνωστικής - Διατάξεις απαγωγής βιοηλεκτρικών σημάτων. [ηλεκτρ. βιβλ.] Αθήνα:Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Διαθέσιμο στο: http://hdl.handle.net/11419/1832
Τσαντής, Σ., 2015. Αρχές φυσικής και τεχνολογίας της διαγνωστικής υπερηχογραφίας. [ηλεκτρ. βιβλ.] Αθήνα:Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Διαθέσιμο στο: http://hdl.handle.net/11419/5978

COURSE OUTLINE «BIOSTATISTICS»

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	700	SEMESTER	7
COURSE TITLE	Biostatistics		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Exercises	1	

COURSE TYPE	Special Background
PREREQUISITE COURSES:	Suggested courses: Probability and Statistics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
The aim of the course is to allow students to: Calculate probabilities. Describe a variable using the appropriate positioning measures Be able to interpret a correlation coefficient. Know what the power of a statistical test is and what it depends on. Construct appropriate regression models to evaluate the multi-exposure correlation with possible outcomes Students with the end of the course will have acquired a complete knowledge in Biostatistics as they will become familiar with statistical terminology and methodology. They will learn to critically evaluate and critically analyze a study, and to check the reliability of the evidence so that they can make informed decisions based on the findings of the study. Qualifications of the first course are awarded to students who: Will be able to study scientific publications in the field of bioinformatics / biostatistics at advanced level, as well as read new trends in this subject Use the knowledge and research of statistical methodology as applied to Medicine and other Health Sciences Contribute responsibly and effectively to the design, collection and analysis of data across different fields of medicine and other health sciences Contribute to research into the development of new methods of biostatistics and biomedical technology
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Variables - Distinction in continuous and categorical variables. Introduction to Probability Theory. Descriptive statistics and measurements in medicine. Probability distributions for continuous and categorical variables. Central Limit Theorem. Statistical Tests for Variable Correlations. Simple comparisons for continuous variables, average difference for two or more variables and for pairwise measurements - analysis by standard parametric and non-parametric test. Simple comparisons for discontinuous / quality variables – χ -square test, Fisher test, McNemar test. Regression: linear and logarithmic. Survival analysis, Kaplan-Meier curves, log-rank test. Statistical software programs.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided into groups and perform laboratory exercises in a computer laboratory equipped with special software and are on data management in descriptive measures and case tests. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Written final exam (70%) which includes: Multiple Choice Exams. Short answer questions. Effective Problem solving. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page. Laboratory work (30%) that includes: Students must complete Projects for 11 thematic topics. All projects are submitted through e-class, and students have access to the corrections and scores of each project.

Activity	Semester workload
Lectures	39 hours
Laboratory practice	13 hours
Project	33 hours
Study	40 hours
Course total	125 hours

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Αρχές Βιοστατιστικής: Pagano Marcello, Gauvreau Kimberlee.
Ιατρική Στατιστική, Τ. Παπαϊωάννου, Κ. Φερεντίνος, Εκδόσεις Σταμούλης Α.Ε. Αθήνα 2004
Σημειώσεις και Ασκήσεις Καθηγητή.

COURSE OUTLINE «ROBOTICS»

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	800	SEMESTER	7
COURSE TITLE	Robotics		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory work	1	

COURSE TYPE	Special Background, specialized General Knowledge, Skills Development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
The aims of the course are the following: the introduction of the students to the basic concepts and issues of robotics, understanding the structure and function of the robots, the introduction to the modern developments in the field of robotics, the ability to program and develop scripts for robots.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

The Robotics course introduces students to the basic concepts and issues of robotics as well as deals with important developments in the field. Initially, we analyze the basic concepts of robotics, the robotics systems categories and their individual characteristics. Then, the basic mechanical parts of the robots and the robotic arms are discussed. Finally, we analyze the modern methods used in robotics and computers. The theory of the course finds application in the laboratory where the theory and programming of robotic systems is applied.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of electronic presentations posted in e-class. Using software on the computer during the lecture. Use of specialized software. Provide educational material through e-class. Managing work / exercises through a website. Communicating with students via e-mail.

	Electronic chat room for lecturers and students.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory practice	13 hours
Projects	13 hours
Study	69 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Examination of the course can be done in two ways. Written examination at the end of the semester both in theory and in the laboratory. With project work done by the students with a separate theoretical and laboratory part. Laboratory attendance is mandatory

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Graig J., "Εισαγωγή στη Ρομποτική", 3η Έκδοση, Εκδόσεις Τζιολα, ISBN:978-960-418-160-5.
Κουμπουλής Φώτης Ν., Μέρτζιος Βασίλης Γ., "Εισαγωγή στη Ρομποτική", Εκδόσεις Παπασωτηρίου, ISBN:978-960-7530-13-4.

- Related academic journals:

Robotics and Autonomous Systems by Elsevier.
Robotics and Computer-Integrated Manufacturing by Elsevier.
IEEE Journal on Robotics and Automation.
International Journal of Robotics Research.

COURSE OUTLINE «BIOINFORMATICS»

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	800	SEMESTER	8
COURSE TITLE	Bioinformatics		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory work	1	

COURSE TYPE	Special Background
PREREQUISITE COURSES:	Suggested courses: Biostatistics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
This course covers computational techniques for mining the large amount of information produced by recent advances in biology, such as genome sequencing and microarray technologies. Main topics of the course include: DNA and protein sequence alignment, sequence motifs/patterns, phylogenetic trees, protein structures: prediction, alignment, classification

microarray data analysis: normalization, clustering
and biological networks.
The main objective of the course is to provide the student with a solid foundation for conducting further research in bioinformatics. By the end of the course, the students will have learned:
the bioinformatics terminology,
main bioinformatics problems,
and the key methods and tools used in bioinformatics.

General Competences

The general competences that are acquired upon completion of the course are:
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Project planning and management
Criticism and self-criticism
Production of free, creative and inductive thinking

SYLLABUS

Introduction to Bioinformatics
Biological databases
Segmentation Algorithms
Multiple alignment of sequences
Search for patterns in sequences
Phylogenetic analysis
Prediction methods
Markovian models
Structural Bioinformatics
Computational Grammars
Computational Genomics
The Perl programming language

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided into groups and perform laboratory exercises in a computer laboratory equipped with special software and are on data management in descriptive measures and case tests. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Written final exam (70%) which includes: Multiple Choice Exams. Short answer questions. Effective Problem solving.

Activity	Semester workload
Lectures	39hours
Laboratory practice	13 hours
Project	33 hours
Study	40 hours
Course total	125 hours

	Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page. Laboratory work (30%) that includes: Students must complete Projects for 11 thematic topics. All projects are submitted through e-class, and students have access to the corrections and scores of each project.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Bagkos, P., 2015. Βιοπληροφορική. [ebook] Athens:Hellenic Academic Libraries Link. Available Online at: http://hdl.handle.net/11419/5016

M. Zvelebil and J. O. Baum, Understanding Bioinformatics, Garland Science, 2008

D.E. Krane and M.L. Raymer, Fundamental Concepts of Bioinformatics, Pearson Education, 2003.

N. C. Jones and P. A. Pevzner, An Introduction to Bioinformatics Algorithms, MIT press, 2004.

C.A. Orengo, D.T. Jones and J.M.Thornton, Bioinformatics: Genes, Proteins and Computers, Roultledge, 2003.

A. M. Lesk, Introduction to Bioinformatics, Oxford University Press, 2002.

D. Mount, Bioinformatics: Sequence and genome analysis, Cold Spring Harbor Laboratory Press, 2001.

P. A. Pevzner, Computational Molecular Biology: An Algorithmic Approach, MIT press, 2000.

P. Baldi and S. Brunak, Bioinformatics: the machine learning approach (2nd edition), MIT press, 2001.

T. Jiang, Y. Xu, and M. Zhang, eds. Current Topics in Computational Molecular Biology, MIT press, 2002.

S. Karlin, Frontiers of Bioinformatics: Unsolved Problems and Challenges, National Academy Press, 200

COURSE OUTLINE MEDICAL IMAGING SYSTEMS

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	800	SEMESTER	8
COURSE TITLE	Medical Imaging Systems		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	Special Background		
PREREQUISITE COURSES:	Suggested courses: Digital Signal Processing, Signal & Systems, Image and Video Processing, Biomedical Engineering		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
Course Description A comprehensive introduction to medical imaging system will be explored. Common imaging modalities are introduced from the perspectives of both physics and system, including X-ray, CT, Ultrasound, MRI, PET and SPECT.

Prerequisite by Topic
Students taking this course should have complete familiarity with the topics of analog Linear Systems. Specifically students should be familiar with convolution, Fourier Series, Fourier Transforms, and Laplace Transforms in analyzing system characteristics and response. Students should also know the basic concepts taught in algebra, calculus and differential equations courses. These basic concepts include, but are not limited to, limit theory, differentiation, integration, sequences, series, and various techniques for solving differential equations. Students are also assumed to have basic knowledge of MATLAB.
Specific Goals for the Course
Specific Outcomes of Instructions – After completing this course the students should be able to:
Learn the physics of radiography
Understand radiography system
Understand X-ray computed tomography (CT) system
Learn the physics of ultrasound
Understand ultrasound imaging system.
Learn the physics of nuclear medicine.
Understand planar scintigraphy system.
Understand emission computed tomography system, including PET and SPECT.
Learn the physics of magnetic resonance.
Understand magnetic resonance imaging system
Design image reconstruction algorithms
Use MATLAB to do medical image analysis
Relationship to Student Outcomes
This supports the achievement of the following student outcomes:
An ability to apply knowledge of math, science, and engineering to the analysis of electrical engineering problems.
An ability to design and conduct scientific and engineering experiments, as well as to analyze and interpret data.
An ability to identify, formulate, and solve electrical engineering problems.
An understanding of ethical and professional responsibility.
Ability to communicate effectively through written reports and oral presentations.
A recognition of the need for and an ability to engage in life-long learning.
An ability to use modern engineering techniques for analysis and design.
An ability to analyze and design complex devices and/or systems containing hardware and/or software components.
Knowledge of math including differential equations, linear algebra, complex variables and discrete math.

General Competences

The general competences that are acquired upon completion of the course are:
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Project planning and management
Criticism and self-criticism
Production of free, creative and inductive thinking

SYLLABUS

Introduction
Introduction to MATLAB
2D signals and systems
Image quality
Physics of radiography
Radiography system
CT
Physics of Ultrasound
Ultrasound imaging system

Physics of magnetic resonance MRI system Physics of nuclear medicine SPET and PET system ntroduction to medical image analysis

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided into groups and perform laboratory exercises in a computer laboratory equipped with special software and are on data management in descriptive measures and case tests. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory practice</td><td>13 hours</td></tr><tr><td>Project</td><td>33 hours</td></tr><tr><td>Study</td><td>40 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	Written final exam (70%) which includes: Multiple Choice Exams. Short answer questions. Effective Problem solving. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page. Laboratory work (30%) that includes: Students must complete Projects for 11 thematic topics. All projects are submitted through e-class, and students have access to the corrections and scores of each project.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
J. G. Webster, Medical Instrumentation: Application and Design. 4th¬ Edition, Wiley, 2009.
P. Suetens, Foundations of Medical Imaging, Cambridge University Press, 2002

F)Modelling and Data Analysis flow

COURSE OUTLINE Theory of Computation

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Graduate			
COURSE CODE		SEMESTER	7	
COURSE TITLE	Theory of Computation			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Exercises			1	
COURSE TYPE	Special background			
PREREQUISITE COURSES:	Suggested courses: Discrete Mathematics			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	English			
COURSE WEBSITE (URL)				

LEARNING OUTCOMES

Learning outcomes
The course deals with the fundamental principles and the mechanisms of computation, contributing to the bases of Computer Science. In this sense it is a necessary prerequisite for the integrated education of students in the field of Informatics. The aim of the course is to help students understand the basic concepts of the theory of computation, such as automata, recursion and computability, with emphasis on the mathematical abstraction of the computer which is the model of computation. The acquisition of the appropriate theoretical concepts aims at addressing specific subjects of computer theory and on the development of skills for understanding and applying mathematical models of computation to several real problems of system modeling. From a general point of view, the course aims at developing the computational and mathematical "maturity" of the students. Upon successful completion the students should be able to: Understand how computation is related to a language used for describing computations and the concept of language recognition. Understand and apply core mathematical principles of proofs. Be aware of the basic concepts of formal languages and computational models. Describe and explain regular expressions. Understand the use of deterministic and non-deterministic finite automata as regular language recognizers. Design deterministic finite automata to identify regular expressions and regular languages. Understand the difference between deterministic and non-deterministic finite automata and convert non-deterministic to equivalent deterministic ones. Know and apply Pumping Lemma for regular languages. Identify systems whose function can be modeled using finite automata. Identify and describe context-free grammars. Understand the use of deterministic and non-deterministic pushdown automata and design such automata for context-free language recognition. Know Pumping Lemma for context-free languages. Know and apply the algorithm for converting context-free grammars to normal Chomsky form. Understand the operation of deterministic and non-deterministic Turing machines. Design deterministic Turing machines for language recognition and computation.

Understand computational complexity issues (time-bounded Turing machines, P and NP classes of problems)
Be aware of the basic elements of computability of propositional calculus (validity and satisfiability)

General Competences

The general competences that are acquired upon completion of the course are:
Production of free, creative and inductive thinking
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Developing and documenting arguments using structured mathematical thinking
Combined analysis of methods for problem solving
Decision making
Generating new research ideas

SYLLABUS

Section 1. Introduction. Basic concepts and Computability
Sets, relations and functions. Principles of proofs. Computability. Alphabets strings and operations. Formal languages, operations and properties.
Section 2. Regular languages and finite state automata
Regular expressions and regular languages. Finite state automata (deterministic, non-deterministic). Finite state automata and regular languages. Pumping lemma for regular languages. Equivalence between deterministic and non-deterministic finite state automata. Algorithm for deriving a deterministic finite automaton equivalent to a non-deterministic one. Application of finite state automata in system modeling problems.
Section 3. Context-free languages and push down automata
Context-free grammars and languages. Algorithm for converting context-free grammars to a Chomsky normal form. Push down automata (deterministic, non-deterministic). Pumping lemma for context-free languages. Determinism and parsing.
Section 4. Turing machines and computability
Turing machines. Definition and properties. Computing with Turing machines. Combining and extending Turing machines. Non-computability, termination problem, Turing machines and enumerability, acceptability and decidability. Reference to non solvable problems, μ-recursive functions, non solvable problems of grammars.
Section 5. Computational complexity and propositional calculus
Computational complexity. Time-bounded Turing machines. P and NP classes. Propositional calculus. Introduction, syntax, truth values, validity and satisfiability.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of electronic (slide) presentations posted on the e-class platform. Use of software for demonstration purposes during lectures. Educational material is posted on the e-class platform. Students communicate with the instructor using emails and the discussion forum of the course provided by the e-class platform.

TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Solving exercises	13 hours
Study	73 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Examinations are conducted in Greek. Final written examination with questions for developing arguments, problem solving and exercises. (100%) Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

H. Lewis, X. Παπαδημητρίου, Στοιχεία Θεωρίας Υπολογισμού, Εκδόσεις Κριτική, 2005.
M. Sipser, Εισαγωγή στη Θεωρία Υπολογισμού, Πανεπιστημιακές Εκδόσεις Κρήτης, 2009.

- Related academic journals:

Theoretical Computer Science (Elsevier)
Information and Computation (Elsevier)
Theory of Computing Systems (Springer)
Computational Complexity (Springer)
SIAM Journal on Computing
Journal of the ACM

COURSE OUTLINE System Modelling And Control

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Graduate			
COURSE CODE		SEMESTER	7	
COURSE TITLE	System Modelling And Control			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Laboratory work			1	
COURSE TYPE	Special Background			
PREREQUISITE COURSES:	Mathematical Analysis I, II			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/			

LEARNING OUTCOMES

Learning outcomes
The aim of the course is to be able to represent dynamical systems with the use of mathematical models that are coded as computer programs (modelling), to perform experiments on models, which are also coded as computer programs (mathematical simulations), to obtain knowledge of basic principles of control engineering, to be able to analyze systems in the time and state space domains, to design PID controllers and pole placement controllers in state-space and to learn the basics of state estimation by using Kalman filters and particle filters. Upon completion of the course the student will be able to: Simulate simple system models and resolve them/analyze their behavior, by using an appropriate numerical computing environment (Mathematica, Maple, MATLAB/Simulink, Octave, Scilab/Xcos) Perform simulations of the behavior of dynamical system in a numerical computing environment Design new systems by using modelling techniques Describe an automatic control system with feedback, by using differential equations, transfer functions and state-space models Know the basic principles and characteristics of sensors and actuators, as well as their role in the feedback loop Analyze the performance of a feedback control system Design and simulate PID controllers and pole placement controllers in state-space Understand the basic principles of operation of Kalman filters and particle filters Carry out an effective bibliographic search by correlating the open problems with the existing bibliography
General Competences
The general competences that are acquired upon completion of the course are: Promoting free, creative and inductive thinking Working in an interdisciplinary environment Search, analysis and synthesis of data and information, with the use of the necessary techniques Working independently Production of new research ideas

SYLLABUS

Introduction to systems. Systems modelling and model classification. Modelling dynamic systems with transfer functions and state-space models. First and second order systems. Principles and characteristics of sensors and actuators. Industrial PID controllers. State-space control design and

pole placement. Kalman filters and their nonlinear variants. Particle filters. Simulation in a numerical calculation environment (Mathematica, Maple, MATLAB/Simulink, Octave, Scilab/Xcos)

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of electronic presentations and other complementary educational material posted in the department's e-class platform Students communicate with the instructor using e-mail messages and the course's discussion forum available at the department's e-class platform Management of exercises/projects through the department's e-class platform Use of specialized numerical calculation environments, both in the laboratory exercises and during the lectures
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory Exercises</td><td>13 hours</td></tr><tr><td>Project</td><td>20 hours</td></tr><tr><td>Study</td><td>53 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	Students must participate in final term exams (50%). Examination in exercises given during the semester (20%). Students must complete a project, accompanied by a technical report (30%). Students are notified of evaluation criteria at the beginning of the semester, through the course's web page.

ATTACHED BIBLIOGRAPHY

Μαθηματική Μοντελοποίηση, Στ. Καμηνέας, Ευάγ. Χαρμανδάρης,. Ελληνικά Ακαδημαϊκά Συγγράμματα και Βοηθήματα, www.kallipos.gr

Συστήματα Αυτομάτου Ελέγχου, Kuo C. Benjamin, Golnaraghi Farid, Εκδόσεις Ίων, 2010.

Αισθητήρες μέτρησης και ελέγχου, Καλοβρέκτης Κ., Κατέβας Ν., Εκδόσεις Τζιόλα, 2018, ISBN: 978-960-418-758-4

Μέθοδος Ελαχίστων Τετραγώνων και Εφαρμογές, Αγατζά Μπαλοδήμου Α.Μ., Πάνου Γ., Εκδόσεις Τζιόλα, 2018, ISBN: 978-960-418-767-6

Τεχνικές Προσομοίωσης, Θεωρία & Εφαρμογές, Μ. Ρουμελιώτης, Σ. Σουραβλάς, Εκδόσεις Τζιόλα 2015

Προσομοίωση και Εφαρμογές, Σφακιανάκης Μιχάλης, Εκδόσεις Σ. Πατάκης 2001

Θεωρία και προβλήματα στα συστήματα αυτομάτου ελέγχου, αναλογικών και ψηφιακών συστημάτων, DiStefano, Stubberud, Williams, Εκδόσεις Τζιόλα, 2000, ISBN: 978-960-805-029-7.

Σύγχρονα συστήματα αυτομάτου ελέγχου, Dorf, Bishop, Εκδόσεις Τζιόλα, 2003, ISBN: 978-960-805-094-5.

Συστήματα αυτομάτου ελέγχου με Matlab & Simulink, Miller, Εκδόσεις Φούντα, 2007, ISBN: 978-960-330-652-8.

Γραμμικά συστήματα αυτομάτου ελέγχου, Rohrs, Melsa, Schultz, Εκδόσεις Τζιόλα, 1996, ISBN: 978-960-721-941-1.

Ηλεκτρομηχανικά συστήματα μετατροπής ενέργειας, Παπαδόπουλος Ε., Εκδόσεις Fountas, 2010, ISBN: 978960330726-6

Modeling and Simulation of Systems using Matlab and Simulink, D. Chaturvedi, CRC Press, Taylor and Francis Group, 2017

Kalman Filtering: Theory and Practice Using Matlab, Grewal, Andrews, John Wiley & Sons, Inc., 2014, ISBN:9781118851210.

Simulation Modeling and Analysis, A.M. Law, W.D. Kelton, McGraw Hill

Theory of Modeling and Simulation, B. Zeigler, H. Praehofer, T. Kim, Academic Press

Numerical Methods for Engineers, Chapra and Canale, McGraw–Hill (4th edition or later).

MATLAB programming for engineers, Chapman, Brookes–Cole (3rd edition or later).

Mathematical Modeling with Case Studies: A Differential Equation Approach Using Maple, B. Barnes and G.R. Fulford, Taylor and Francis Publishers, 2002.
Modeling and simulation in Scilab/Scicos, Campbell S., Chancelier J.-P., Nikoukhah R., Springer, 2005, ISBN: 978-038-727-802-5.
Modeling and simulation for automatic control, Egeland O., Gravdahl, J.T., Marine Cybernetics, 2002, ISBN: 829-235-601-0.

COURSE OUTLINE Data Analysis

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE		SEMESTER	7
COURSE TITLE	Data Analysis		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	Special background		
PREREQUISITE COURSES:	Probabilities and Statistics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	English		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
Data analysis deals with the set of techniques for analyzing unstructured data. This is, mainly, done by statistical techniques, and through this analysis information constitutes useful knowledge. This knowledge consists of conclusions and forecasts drawn from the data and used to support decision-making. This process of data processing and analysis is the necessary background for scientific fields and technologies such as machine learning, opinion mining, sentiment analysis, decision support systems, etc. The course is designed to cover both classical statistical methods of data analysis as well as the contribution of important techniques that have emerged from the area of machine learning. Emphasis is given to the use of a computational environment and/or a statistical package. This will help the students to become familiar with the application of the techniques presented in theory. Its aim is to support students to receive all the necessary knowledge for analyzing any data and draw useful conclusions which will enable them to make better decisions about the subject at hand. Upon successful completion the students should be able to: Understand the principles and methods of statistical inference and hypothesis testing and apply them to data analysis. Be aware of how to select data and prepare their processing using either statistical methods or machine learning techniques. Understand, select and apply the most appropriate analysis method in order to systematically approach and solve problems of science and technology. Understand the results of data analysis and their use in decision making. Know how to use statistical computing packages or programming in computing environments the methods for preparing and analyzing the data. Be aware of the different sources of uncertainty and the different types of data under uncertainty. Know and apply the concept of interval numbers and interval arithmetic. Understand and apply basic statistics for the analysis of interval data. Perform effective bibliographic research linking open problems with literature. Identify and distinguish between research issues and implementation problems.
General Competences

The general competences that are acquired upon completion of the course are:
Production of free, creative and inductive thinking
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Developing and documenting arguments using structured mathematical thinking
Combined analysis of methods for problem solving
Decision making
Generating new research ideas

SYLLABUS

Section 1. Statistical theory and techniques
Data analysis: Problems, hypotheses and techniques.
Types of data: static and varying, determinism and uncertainty.
Descriptive Analysis.
Distributions and Simulation.
Statistical Inference (Confidence Intervals, Parametric and Non-parametric Hypothesis Testing).
Regression Analysis.
Analysis of variance.

Section 2. Feature selection
Outlier removal and normalization.
Missing data.
Feature selection with hypothesis testing.
The Receiver Operating Characteristic Curve.
Class separability measures.

Section 3. Analysis of uncertain data
Types of uncertainty and data under uncertainty.
Fuzzy data.
Interval data and interval arithmetic.
Elements of interval analysis.
Statistical analysis of interval data.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of electronic (slide) presentations posted on the e-class platform. Use of software for demonstration purposes during lectures. Use of specialized software. Educational material is posted on the e-class platform. Students communicate with the instructor using emails and the discussion forum of the course provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory work	13 hours
Supervision for essay writing, project development	8 hours
Essay writing, project development	20 hours
Study	45 hours

	Course total: 125 hours
STUDENT PERFORMANCE EVALUATION	Examinations are conducted in Greek. Final written examination with questions for developing arguments, problem solving and exercises. (50%) Essay on a specific topic with oral presentation, or study of a method with algorithm implementation and presentation of its application. (50%) Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Φουσκάκης, Δ. (2013). Ανάλυση Δεδομένων με Χρήση της R. Εκδόσεις Τσότρας. Αθήνα.

S. Theodoridis, K, Koutroumbas, Αναγνώριση Προτύπων, Εκδόσεις Πασχαλίδης, Αθήνα, 2012.

Θ. Ν. Γράψα, Εισαγωγή στην Ανάλυση Διαστημάτων – Interval Analysis, Εκδόσεις Τζιόλα, Αθήνα, 2012.

D C. Montgomery and G C Runger, Applied Statistics and Probability for Engineers, 6th Edition, John Wiley & Sons, Inc.

Ντζούφρας, Ι., Καρλής, Δ., 2015. Εισαγωγή στον προγραμματισμό και στη στατιστική ανάλυση με R. [ηλεκτρ. βιβλ.] Αθήνα:Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Διαθέσιμο στο: http://hdl.handle.net/11419/2601

S. Theodoridis, A. Pikrakis, K, Koutroumbas, D. Cavouras, Εισαγωγή στην Αναγνώριση Προτύπων με MATLAB, Εκδόσεις Πασχαλίδης, Αθήνα, 2011.

- Related academic journals:

Computational Statistics and Data Analysis

International Journal of Data Science and Analytics

Advances in Data Analysis and Classification

Reliable Computing

COURSE OUTLINE Gamification

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Graduate			
COURSE CODE	800	SEMESTER	8	
COURSE TITLE	Gamification			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Laboratory work			1	
COURSE TYPE	special background			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/			

LEARNING OUTCOMES

Learning outcomes
Upon completion of this course, students will be able to: Understand the basic concepts of the gamification and its use to applications Be aware of the basic building blocks of a gamification system (avatars, ranking, points, emblems, leaderboards, etc.) Design a gamification process using different building blocks in order to make the learning process attractive. Integrate gamification processes into IT applications.
General Competences
The general competences that are acquired upon completion of the course are: Production of free, creative and inductive thinking Generating new research ideas Working independently Game design and management for more engaging learning Developing original tools Using ready-made tools and integrating them into organized learning processes

SYLLABUS

Introduction: Course overview and logistics. Gamification defined. Why study gamification? History of gamification. Categories and examples. Games: Gamification in context. What is a game? Games and Play. Video games. It's Just a Game? Game Thinking: Why Gamify. Thinking Like a Game Designer. Design rules. Tapping the Emotions. Anatomy of Fun. Finding the Fun. Game Elements. Behaviorism: Gamification as motivational design. Behaviorism. Behaviorism in gamification. Reward structures. Reward schedules. Beyond Behaviorism: Limits of behaviorism. Dangers of behaviorism. Extrinsic and intrinsic rewards. Gamification Design Framework: Design Thinking. Design Choices: Two approaches to gamification. Designing for collective good. Designing for happiness. Enterprise Gamification: Enterprise applications. Workplace motivations. The game vs. the job. Social Good and Behavior Change. Critiques and Risks: Exploitationware. Gaming the game. Legal issues. Regulatory issues. Beyond the Basics. The future of gamification.

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Use of electronic (slide) presentations posted on the e-class platform.
Use of software for demonstration purposes during lectures.
Use of specialized software.
Educational material is posted on the e-class platform.
Students communicate with the instructor using emails and the discussion forum of the course provided by the e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory work</td><td>13 hours</td></tr><tr><td>Project</td><td>30 hours</td></tr><tr><td>Study</td><td>43 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Students must participate in final term exams (70%).
Students must complete laboratory exercises and a project accompanied with a technical report (30%).
Laboratory attendance is optional. All students are required to deliver 3 essays. The final result for the laboratory will be the average of the grade of the three essays.
Successful laboratory and project work are valid for the next years. The final and the intermediate tests should be marked at least 5/10.
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

Deloitte, Gamification: Gaming Gets Serious, Tech Trends 2012
Bing Gordon, Hacking Gamification, 2012
Jesse Schell, The Art of Game Design: A Book of Lenses
David Freedman, The Perfected Self, The Atlantic, June 2012
Katie Salen and Eric Zimmerman, Rules of Play: Game Design Fundamentals, The MIT Press 2004
Jesse Schell, The Art of Game Design: A Book of Lenses, Taylor & Francis Ltd.; 2 edition, 2014
Sebastian Deterding, et al, From Game Design Elements to Gamefulness: Defining “Gamification”, Proc. 15th Intl. Academic Mind Trek Conf., 2011
Robin Hunicke et al, MDA: A Formal Approach To Game Design and Game Research, Proc. Challenges in Game AI Workshop, 2004
Scott Nicholson, A User-Centered Theoretical Framework for Meaningful Gamification, June 2012
JP Rangaswami, Does Gamification Create Real Business Value? Part 2, I-CIO
ROI Research, "Gaming for Good", www.roiresearch.com/register.asp
Margaret Robertson, Can't Play, Won't Play, Hide & Seek Blog, October 6, 2010
Seth Priebach, The Game Layer on Top of the World, TEDxBoston 2010
Any Kamenetz, The Power of the Prize, Fast Company, May 1, 2008

COURSE OUTLINE Operational Research

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Graduate			
COURSE CODE	800	SEMESTER	8	
COURSE TITLE	Operational Research			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Exercises			1	
COURSE TYPE	special background			
PREREQUISITE COURSES:	Linear Algebra			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/			

LEARNING OUTCOMES

Learning outcomes
Upon completion of this course, students will be able to: Formulate a real-world problem as a mathematical programming model Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand Understand the relationship between a linear program and its dual Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change Solve specialized linear programming problems like the transportation and assignment problems Understand the applications of, basic methods for, and challenges in integer programming Apply techniques and algorithms to solve specific linear programming problems.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Decision-making Project planning and management Working independently

SYLLABUS

Introduction to Operations research. Mathematical models of operations research. Solution of the operations research models. Unrestricted extremum problems. Constrained extremum problems. Introduction to linear programing (LP) Linear programming models with binary variables. Graphical method of solution of the linear programming problem. Graphical Sensitivity Analysis. Standard form of the linear programming problem. Transition from graphical to algebraic solution. Simplex method. Special cases in applying the simplex method. Dual program identification. The relations between direct and dual problem. Economic interpretation of duality. Transportation models Solution of the transportation problem. Linear integer programming. Problem-solving of the linear integer programming. Problem-solving methods of the linear integer programming.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of the course’s webpage that keeps educational material of previous academic years that is updated every year.
Lectures typically use electronic presentations, writing, executing and criticizing segments of code.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
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<tr><td>Study</td><td>53 hours</td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Students must complete a project accompanied with a technical report (30%).
Students must participate in final term exams (70%).
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

Operations research: applications and algorithms. Winston, Wayne L., Duxbury, Belmont, 1994
Linear programming: methods and applications, Gass, Saul I, McGraw-Hill, , New York, 1985
Operations research: an introduction, Taha, Hamdy A. Pearson, Boston, 2011
Hillier, F.; Lieberman, G. Introduction to Operations Research, 8th Ed. McGraw-Hill, 2005
Επιχειρησιακή Έρευνα: Μέθοδοι και Τεχνικές Λήψης Αποφάσεων, Υψηλάντης Π., εκδ. Πρόπομπος (5η Έκδοση), Αθήνα 2015.
Επιχειρησιακή Έρευνα, Taha H., 9η έκδοση, Εκδόσεις Τζιόλα 2015
Επιχειρησιακή Έρευνα και Οργάνωση Συστημάτων Παραγωγής, Κώστογλου Β., Εκδόσεις Τζιόλα 2016
Εισαγωγή στην Επιχειρησιακή Έρευνα, Τσάντας Ν.Δ., Βασιλείου Π.–Χ.Γ., Αλγόριθμοι και Εφαρμογές, εκδ. Ζήτη, Θεσσαλονίκη 2000.
Γραμμικός Προγραμματισμός, Αγγελής, Β., Εκδόσεις ΕΑΠ, 2008.
Γραμμικός Προγραμματισμός, Αριστοποίηση σε Δίκτυα, Λουκάκης Μ., εκδ. Ζυγός, Θεσσαλονίκη 1994.
Ποσοτική Ανάλυση για τη Λήψη Διοικητικών Αποφάσεων, τόμος Α, Οικονόμου Γ.Σ, εκδ. Ευγ. Μπένου, Αθήνα 1999.

COURSE OUTLINE Statistical Machine Learning

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Graduate			
COURSE CODE		SEMESTER	8	
COURSE TITLE	Statistical Machine Learning			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Laboratory work			1	
COURSE TYPE	Special background, skills development			
PREREQUISITE COURSES:	Probabilities and Statistics, Mathematical Analysis II			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	English			
COURSE WEBSITE (URL)				

LEARNING OUTCOMES

Learning outcomes
The aim of the course is to describe Machine Learning with emphasis on the statistical aspects and methodology which are dominant in modern machine learning. The course combines theory, methodology and computational techniques. The theoretical concepts are presented in order to enhance students' theoretical background. At the same time the aim is to support their ability to select appropriate theoretical tools and methodologies for solving practical problems as well as the students' introduction in the research perspectives of the field. Learning algorithms are studied from a theoretical point of view regarding their statistical properties and performance while they are analyzed from a practical point of view in terms of implementation and effectiveness. Upon successful completion the students should be able to: Be aware of the principles and methods of statistical learning theory and its relationship with well-known approaches of machine learning. Understand the statistical nature of machine learning concepts and methods and their relationship with data processing. Understand, select and apply the most appropriate method of machine learning to approach and solve science and technology problems in a systematic way. Select and implement efficient machine learning algorithms for modeling data and systems. Understand the open problems in the field of machine learning and modeling of data and systems. Perform effective bibliographic research linking open problems with literature. Identify and distinguish between research issues and implementation problems.
General Competences
The general competences that are acquired upon completion of the course are: Production of free, creative and inductive thinking Search for, analysis and synthesis of data and information, with the use of the necessary technology Developing and documenting arguments using structured mathematical thinking Combined analysis of methods for problem solving Decision making Working in an interdisciplinary environment

Generating new research ideas

SYLLABUS

Section 1. Statistical techniques
Basic statistical techniques in machine learning: probability density estimation, mixture models, parameter estimation, model selection.
Non-parametric regression. Non-parametric probability density estimation.
Bayesian decision theory. Bayesian probability density estimation.

Section 2. Parametric techniques
Bayesian classification.
Support Vector Machines.
Hidden Markov Models.
Algorithm design/implementation in R, MATLAB/Octave.

Section 3. Non-parametric techniques
Clustering and related statistical techniques (k-means, k-median).
DBSCAN algorithm.
Bootstrap και Subsampling
Algorithm design/implementation in R, MATLAB/Octave.

Section 4. Statistical techniques and Neural networks
Bayesian learning in neural networks. Probabilistic neural networks.
The problem of generalization. The Bias-Variance dilemma and Vapnik – Chervonenkis dimension.
Statistical interpretation of the multilayer perceptron.
No Free Lunch Theorem for machine learning techniques.

Section 5. Dimensionality reduction
Karhunen-Loeve transform.
Singular Value Decomposition and Principal Component Analysis.
Graph theoretic dimensionality reduction. Laplacian eigenmaps. Local linear embedding. Isometric mapping.
Dimensionality reduction with Kohonen's Self-Organizing Maps and Auto-associative Neural Networks.

Section 6. Kernel machines
Mercer kernels and reproducing kernel Hilbert spaces. Relationship with non-parametric statistics. Kernel based classification. Support Vector Machines (the non-linear case). Radial Basis Function neural networks. Kernel perceptrons.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of electronic (slide) presentations posted on the e-class platform. Use of software for demonstration purposes during lectures. Use of specialized software. Educational material is posted on the e-class platform. Students communicate with the instructor using emails and the discussion forum of the course provided by the e-class platform.	

TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Exercises	13 hours
Supervision for essay writing, project development	8 hours
Essay writing, project development	20 hours
Study	53 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Examinations are conducted in Greek. Final written examination with questions for developing arguments, problem solving and exercises. (50%) Essay on a specific topic with oral presentation, or study of a method with algorithm implementation and presentation of its application. (50%) Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

S. Theodoridis, K, Koutroumbas, Αναγνώριση Προτύπων, Εκδόσεις Πασχαλίδης, Αθήνα, 2012.
T. Hastie, R. Tibshirani, J. Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer Texts in Statistics, Springer-Verlag, New York, 2001.
C. Bishop, Pattern Recognition and Machine Learning, Springer, Information Science and Statistics Series, 2006.
R. Neal, Bayesian Learning for Neural Networks, Springer, New York, 1996.
S. Theodoridis, A. Pikrakis, K, Koutroumbas, D. Cavouras, Εισαγωγή στην Αναγνώριση Προτύπων με MATLAB, Εκδόσεις Πασχαλίδης, Αθήνα, 2011.

- Related academic journals:

Journal of Machine Learning Research
IEEE Transactions on Neural Networks and Learning Systems
Neural Networks
Neural Computing and Applications
Journal of the American Statistical Association

G) Telecommunications flow

COURSE OUTLINE Antennas-Micreowaves

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE	700	SEMESTER	8
COURSE TITLE	Antennas-Micreowaves		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	2	5
Laboratory Exercise	2	

COURSE TYPE	General background, general knowledge, Skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course, students will be able to: Describe the mechanism of radiation of an antenna Describe the features of an antenna Calculate the directionality and the gain Calculate the radiation diagram Calculate the circuit features of an antenna Calculate the features of a linear antenna, a loop antenna and an array antenna Calculate the features of an antenna with a measuring arrangement and AWRDE
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

Introduction. Radiation mechanism. Radiation mechanism. Radiation regimes. Isotropic radiator. Radiation strength. Directionality and calculation methods for it. Gain and efficiency factor. An antenna as circuit element and an aperture. Friis formula. Linear antennas. Analysis of a random length linear bipolar antenna. λ/2 dipole: radiation diagram, directionality, gain. Effective height. Antennas over ideal terrain. General analysis of an antenna radiation field. Applications. Introduction to array-antennas. Linear array-antennas. Uniform linear array-antennas.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises.

	Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	26 hours
Laboratory practice	13 hours
Study and analysis of bibliography	15 hours
Project	15 hours
Non-directed study	30 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	The final score for the course will be 70% from the final written exams and 30% from the team project. For succeeding the exams, the score of the written exams should be at least 50/100. The project score is valid only for the current exams period. For the laboratory exams the evaluation criteria for "successful/not successful'' will be applied. The students that fail in the laboratory exams will not participate in the final exams of the course. Attendance of the laboratory exercises is obligatory. All students are required to deliver 3 essays, that are also evaluated with the "successful/not successful" criteria, in order to be examined for the laboratory part. If an essay is rated not successful the student is obliged to repeat the essay and to be re-examined before the upcoming of the laboratory part of the course. Successful examination of the laboratory part of the course can be preserved for the following years. The midterm score is valid only for the current exams period. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Χ. Καψάλης, Π. Κωττής, Κεραίες - Ασύρματες Ζεύξεις, 1η έκδοση, Τζιόλα, 2008. Κωδικός στον Εύδοξο:18548842.
C. Balanis, Κεραίες - Ανάλυση και Σχεδίαση, 1η έκδοση, Ίων, 2005. Κωδικός στον Εύδοξο: 14634.
Σημειώσεις του διδάσκοντα.

COURSE OUTLINE Microwave integrated circuits

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE		SEMESTER	8
COURSE TITLE	Microwave integrated circuits		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		2	5
Laboratory exercises		2	
COURSE TYPE	General background, general knowledge. Skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course, students will be able to: Describe the design of Monolithic Microwave Integrated and Microwave circuits Describe microwave technologies Know the process for designing microwave filters, amplifiers and LNA Know the transmission lines theory, the scattering factors, the method for fitting a complex resistor with discrete elements Calculate the features of Monolithic Microwave Integrated and Microwave circuits with a measuring arrangement and specialized software AWRDE and ADS
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

Introduction. Presentation of modern state of the art on designing and implementation of electronic circuits and RF layouts. Design of Monolithic Microwave Integrated and microwave circuits. Microwave technologies. Transmission lines, scattering factors, methods for fitting a complex resistor with discrete elements, Smith's map. Microwave filters, amplifiers and LNA design. Chip components, printed circuits, waveguide circuits, microfilms and coplanar waveguides. Multilayer printed circuits, MIC, MMIC, LTCC/HTCC. Cad packages for designing and simulating MMIC.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises.

	Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	26 hours
Laboratory practice	26 hours
Study and analysis of bibliography	15 hours
Project	15 hours
Non-directed study	43 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	The final score for the course will be 60% from the final written exams and 40% from the team project. For the laboratory exams the evaluation criteria for "successful/not successful'' will be applied. The students that fail in the laboratory exams will not participate in the final exams of the course. Attendance of the laboratory exercises is obligatory. All students are required to deliver 3 essays, that are also evaluated with the "successful/not successful" criteria, in order to be examined for the laboratory part. If an essay is rated not successful the student is obliged to repeat the essay and to be re-examined before the upcoming of the laboratory part of the course. For succeeding the exams, the score of the written exams should be at least 50/100. The project score is valid only for the current exams period. Successful examination of the laboratory part of the course can be preserved for the following years. The midterm score is valid only for the current exams period. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Εισαγωγή στα Μικροκύματα, Ν.Κ. Ουζούνογλου, εκδόσεις Παπασωτηρίου
Microwave Transistor Amplifiers. G. Gonzalez. Prentice Hall 1997
Foundations for Microwave Engineering. R.E. Collin. Mc Graw Hill 1992
Σημειώσεις του διδάσκοντα.

COURSE OUTLINE Optical communications- Waveguides

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE		SEMESTER	7
COURSE TITLE	Optical communications- Waveguides		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory practice	1	

COURSE TYPE	Special background, Specialized general knowledge, Skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course, students will be able to: Understand the operation of the components of the optical fiber communication system Detect the advantages and disadvantages of the optical communication system Design and comprehend the role of optical fibers as a communication channel of optical systems Apply geometrical optics for the explanation of waveguiding mechanisms Apply Maxwell's equations for the description of wave propagation in optical fibers Detect the origin of dispersion in fibers Take into account the restriction in the bit rate transmission and in the transmission distance due to dispersion effects Analyze the loss mechanisms in optical fibers networks Detect the constructional details for designing optical fiber cables Comprehend and describe the coupling between optical waveguides
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work Working in an interdisciplinary environment Production of free, creative and inductive thinking

SYLLABUS

Evolution of optical fibers communication systems, fundamentals of optics, waveguiding conditions, propagation conditions in optical fibers, dispersion and loss mechanisms, fundamentals of optical fiber networks components

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory practice	13 hours

	Non-directed study: 73 hours Course total: 125 hours
STUDENT PERFORMANCE EVALUATION	The final score for the course will be 70% from the final written exams and 30% from the laboratory exams. Attendance of the laboratory exercises is obligatory. Students will be evaluated through exams (oral or written) during each laboratory exercise. Final score for the laboratory part will result from the average performance of the laboratory exercises. For succeeding the exams, the score of the written exams should be at least 50/100. Successful examination of the laboratory part of the course and the project can be preserved for the following years. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Συστήματα επικοινωνιών με οπτικές ίνες, G. P. Agrawal, 4η έκδοση, Εκδόσεις Τζιόλα, 2016
Fiber Optic Communications, Shiva Kumar, M. Jamal Deen, Wiley, 2014
Photonics: Optical electronics in modern communications, Amnon Yariv, Pochi Yeh,sixth edition, Oxford University Press, 2007
Fundamentals of Photonics, B.E.A. Saleh, M.C. Teich, Wiley, 2nd edition, 2007
Optoelectronics and Photonics: Principles and Practices, S.O. Kasap, 2nd edition

COURSE OUTLINE Cooperative communication systems

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE		SEMESTER	8
COURSE TITLE	Cooperative communication systems		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Exercises		1	
COURSE TYPE	General background, General knowledge, Skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course, students will be able to: Describe and analyze the modulation of spectrum dispersion Describe the characteristics of a CDMA system Describe the factors that affect the performance of a CDMA system Describe and analyze the OFDM modulation and an OFDMA system Calculate the performance of an OFDMA system Describe the diversity techniques, calculate their efficiency and complexity Describe the architecture of a 4G network Describe the methodology of designing a 5G system and the key performance indicators
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

Introduction to design and analysis of cellular communication systems (fixed, wireless and mobile). Multiplexing methods and modern cellular systems. Natural background (modulation methods and implementation of spectrum expansion, RAKE receiver, multiplexing, logical channels and control mechanisms). Diversity techniques (frequency, polarization, time, space) and efficiency improvement techniques. Radio resource management methods. Introductions to orthogonal frequency division multiplexing (OFDM). Characteristics of WCDMA-OFDMA 3G-4G systems. Methodology and design issues of mobile communications cellular systems (network planning). Basic principles of 5G systems. Introduction to 6G Collaborative Networks.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code.

	Students are divided in groups and perform laboratory programming exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	The final score for the course will be 70% from the final written exams and 30% from the laboratory exams. For succeeding the exams, the score of the written exams should be at least 50/100. Successful examination of the laboratory part of the course and the project can be preserved for the following years. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

Activity	Semester workload
Lectures	39 hours
Exercises	13 hours
Study and analysis of bibliography	15 hours
Project	15 hours
Non-directed study	43 hours
Course total	125 hours

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Αθ.Κανάτας, Φ. Κωνσταντίνου, Γ. Πάντος, Συστήματα Κινητών Επικοινωνιών, 2η έκδοση, Παπασωτηρίου, 2013. Κωδικός στον Εύδοξο: 33154041.
T. Rappaport, Ασύρματες επικοινωνίες, 2η έκδοση, Γκιούρδα, 2006. Κωδικός στον Εύδοξο: 12270.
B. Blank, P. DiPiazza, B. Ferguson, Εισαγωγή στα ασύρματα συστήματα, 1η έκδοση, Γκιούρδα, 2010. Κωδικός στον Εύδοξο: 12421.
Σ. Κωτσόπουλος, Αρχές και Μοντελοποίηση Ασύρματης Διάδοσης, 1η έκδοση, Τζιόλα, 2015. Κωδικός στον Εύδοξο: 50656005.
Σημειώσεις του διδάσκοντα.

COURSE OUTLINE Nanoelectronic devices

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE		SEMESTER	8
COURSE TITLE	Nanoelectronic devices		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		2	5
Laboratory work		2	
COURSE TYPE	Special background, Specialized general knowledge, Skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course, students will be able to: Comprehend the fundamentals that rule nanometric devices Comprehend and apply the fundamentals of quantum mechanics, waves and particles, charge quantum confinement effects and the fundamental features of solid state of materials, i.e. all the effects that are necessary for studying a wide range of nanometric devices Comprehend the principles of operation of a few or even single electron configurations Describe tunneling effects and Coulomb blockade effect and apply them for the behavior of single-particle arrays Analyze and design single-electron transistor structures (an important structure for the configuration of the technology of electronic and photonic systems) Analyze the behavior of numerous electrons configurations via classical and quantum statistical methods approximations that are incorporated in studying quantum dots, quantum wires and quantum wells Comprehend and apply the electron ballistic transport effect
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

Nanometric configuration technology, physical principles and effects that rule nanometric objects, fundamental principles of nanoelectronics, single-electron devices, electron transport in nanoscopic systems, quantum wells, quantum dots and quantum wires applications, ballistic behavior

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code.

	Students are divided in groups and perform laboratory programming exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	The final score for the course will be 75% from the final written exams and 25% from the project. Project's accomplishment is obligatory and has to be delivered in paper form at the end of the semester. For succeeding the exams, the score of the written exams should be at least 50/100. Successful examination of the final exams of the course can be preserved for the following years. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

Activity	Semester workload
Lectures	26 hours
Laboratory practice	26 hours
Essay writing	13 hours
Non-directed study	60 hours
Course total	125 hours

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
George W. Hanson, Αρχές Νανοηλεκτροικής, Εκδόσεις Τζιόλα 2018
V.V. Mitin,V.A. Kochelap and M.A. Stroscio, Introduction to Nanoelectronics, Cambridge University Press, 2008
R.T. Tsu, Superlattice to Nanoelectronics, Elsevier, 2012.
V.V. Mitin, D.I. Sementsov and N.Z. Vagidov, Quantum Mechanics for Nanostructures, Cambridge University Press, 2010
D.M. Kim, Introductory Quantum Mechanics for Applied Nanotechnology, Wiley, 2015

COURSE OUTLINE Optoelectronics

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE		SEMESTER	8
COURSE TITLE	Optoelectronics		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		2	5
Laboratory work		2	
COURSE TYPE	Special background, Specialized general knowledge, Skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course, students will be able to: Comprehend the features and nature of light, as well as the mechanisms of light-matter interaction Comprehend the basic principles that rule the operation of basic optoelectronic configurations, important for optical communications and optical electronics (e.g lasers, photodetectors, photodiodes etc.) Comprehend the generation and manipulation of optical radiation Comprehend the principles of nonlinear optics and its effect on information transport Apply the knowledge on the design of photonic devices for information transport
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work Working in an interdisciplinary environment Production of free, creative and inductive thinking

SYLLABUS

Optoelectronic device technology, physical principles and effects that rule materials and devices that are used as photonic and optoelectronic components, fundamentals of optics, electronics, light-matter interaction, nonlinear optical effects that arise in optoelectronic devices, operation principles and design of optoelectronic devices.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.

TEACHING METHODS	

Activity	Semester workload
Lectures	26 hours
Laboratory practice	26 hours
Essay writing	13 hours
Non-directed study	60 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	The final score for the course will be 50% from the final written exams, 25% from the project and 25% from the laboratory exams. Attendance of the laboratory exercises is obligatory. Students will be evaluated through exams (oral or written) during each laboratory exercise. Final score for the laboratory part will result from the average performance of the laboratory exercises. Project's accomplishment is obligatory and has to be delivered in paper form at the end of the semester. For succeeding the exams, the score of the written exams should be at least 50/100. Successful examination of the final exams of the course can be preserved for the following years. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Photonics: Optical electronics in modern communications, Amnon Yariv, Pochi Yeh,sixth edition, Oxford University Press, 2007
Οπτοηλεκτρονική : Μια εισαιγωγή, Hawkes J., Wilson John, Τρίτη αγγλική έκδοση, Πανεπιστημιακές εκδόσεις ΕΜΠ, 2004
Οπτολεκτρονική, Jasprit Singh, Εκδόσεις Τζιόλα, 2015.
Φυσική των λέιζερ, Στέλιος Κουρής, Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα και Βοηθήματα, www.kallipos.gr,2015
Fundamentals of Photonics, B.E.A. Saleh and M.C. Teich, Wiley, 2007

H) Network flow

COURSE OUTLINE Telecommunication Networks

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Graduate			
COURSE CODE		SEMESTER	8	
COURSE TITLE	Telecommunication Networks			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures and			3	5
Exercises			1	
COURSE TYPE	General background, General knowledge, Skills development			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	e-class			

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Description and analysis of the basic principles of all cellular and wireless communication networks Evaluation of the efficiency of mechanisms for a series of functions (e.g. handover, location management) Explanation of the basic dysfunctionality problems of different access systems and their treatment Specification and analysis of cellular and wireless systems problems that arise in different interfaces and ways of treatment
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

Introduction to design and analysis of telecommunication networks (fixed, wireless and mobile). Architecture of cellular systems, radio-channel management, mobility management, communication management, dysfunctionality management, cellular networks management, quality service support.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours

	Exercises	13 hours
	Study and analysis of bibliography	15 hours
	Project	15 hours
	Non-directed study	43 hours
	Course total	125 hours
STUDENT PERFORMANCE EVALUATION	The final score for the course will be 70% from the final written exams and 30% from the project. For succeeding the exams, the score of the written exams should be at least 50/100. Successful examination of the project is valid only for the current exams period. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Αθ.Κανάτας, Φ. Κωνσταντίνου, Γ. Πάντος, Συστήματα Κινητών Επικοινωνιών, 2η έκδοση, Παπασωτηρίου, 2013. Κωδικός στον Εύδοξο: 33154041.
T. Rappaport, Ασύρματες επικοινωνίες, 2η έκδοση, Γκιούρδα, 2006. Κωδικός στον Εύδοξο: 12270.
B. Blank, P. DiPiazza, B. Ferguson, Εισαγωγή στα ασύρματα συστήματα, 1η έκδοση, Γκιούρδα, 2010. Κωδικός στον Εύδοξο: 12421.
Σ. Κωτσόπουλος, Αρχές και Μοντελοποίηση Ασύρματης Διάδοσης, 1η έκδοση, Τζιόλα, 2015. Κωδικός στον Εύδοξο: 50656005.
Σημειώσεις του διδάσκοντα.

COURSE OUTLINE Special Topics in Networks

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE		SEMESTER	7	
COURSE TITLE	Special Topics in Networks			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Exercises			1	
COURSE TYPE	Special background			
PREREQUISITE COURSES:	Network Protocols and Architecture or Computer Networks.			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek/English for Erasmus students.			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)				

LEARNING OUTCOMES

Learning outcomes
As a result of successfully completing this course, students will: Explain in detail a wide range of technologies used to design and build data networks. Understand the basic design principles of the network and the requirements of large-scale networks. Apply the basic principles of network design and / or expansion with specific examples. Apply technologies, install and configure applications and services on specific networks. Understand how applications in different machines communicate. Recognize / select / configure network mechanisms, capable to make a network under design / management efficient at the lowest possible cost. Become familiar with basic methods of managing network services. Understand and manage existing network services such as DHCP, FTP, MAIL, Proxy, etc. Become familiar and understand the new trends in computer networks and to assess the impact of these trends on economic and social life.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Quality of Services, Network resources allocation, TCP congestion and TCP congestion avoidance mechanisms, Infrastructure and network configuration services (DNS, DHCP, FTP, DNS, etc.) Network scaling: architecture, devices and their function. Design small, medium and large scale LAN, Device configuration and routing protocols (OSPF, EIGRP, etc.) in IP networks.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use course's webpage that keeps educational material of previous academic years and is updated every year. Lectures typically use electronic presentations. Students are divided in groups and perform laboratory exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory and project tutorial	13 hours
Project writing	23 hours
Non directed study	50 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Because of the importance of understanding both the theoretical and hands-on elements of special topics in networking, students must pass all the components of the course (laboratory, exams and projects) in order to receive a passing grade for the course. The course grade will be based on: Final exams (50%) Laboratory exercises (20%) Project (30%) Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Δίκτυα Υπολογιστών: Μια προσέγγιση από τη σκοπιά των συστημάτων, 4η Αμερικανική έκδοση, Εκδόσεις Κλειδάριθμος (2009). ISBN : 978-960-461-266-6
Δικτύωση Υπολογιστών: Προσέγγιση από Πάνω προς τα Κάτω, J.F. Kurose and K.W.Ross, Εκδόσεις Γκιούρδα, Έβδομη Έκδοση, 2018, ISBN: 978-960-512-7022.
Scaling Networks v6 Companion Guide, Johnson, Allan, version 6 2017, Pearson Education Cisco Networking Academy - SBN-10: 1-58713-434-9, ISBN-13: 978-1-58713-434-0
https://linoxide.com/linux-how-to/install-configure-dhcp-ubuntu/
End-to-end quality of service over heterogeneous networks. Braun, T.[et al.]. New York: Springer, 2008, Διαθέσιμο
https://eden.dei.uc.pt/~edmundo/Cap%20Livros/CL08%202008%20Springer%20Diaz.pdf
QoS over heterogeneous networks. Chichester, Marchese, M. , Hoboken, NJ: John Wiley & Sons, 2007. ISBN 978- 0470017524. Hardy, W.C.
QoS: measurement and evaluation of telecommunications quality of service. Chichester: John Wiley & Sons, 2001. ISBN 978-0471499572.
Internet QoS: Architectures and Mechanisms for Quality of Service, Wang, Morgan Kaufmann, 2001.
- Related academic journals:

COURSE OUTLINE Optical Communication Networks

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Graduate		
COURSE CODE		SEMESTER	8
COURSE TITLE	Optical Communication Networks		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	Special background, Specialized general knowledge, Skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course, students will be able to: Comprehend the way to design and the efficiency of an optical communication network by appropriate connection of the individual components Examine the effects of losses, dispersion and nonlinearities in optical fibers for the design of the optical system Calculate appropriately the efficiency of the system Design and calculate the efficiency of coherent single-channel optical networks Detect and appropriately design multi-channel optical networks by using the proper multiplexing techniques Comprehend the principles of operation of the proper techniques and processing devices of the optical signal
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work Working in an interdisciplinary environment Production of free, creative and inductive thinking

SYLLABUS

Design and efficiency of optical communication systems. Architectures of the system. Coherent optical systems. Digital modulation. Multi-channel optical systems. Multiplexing techniques. Optical signal processing. Flip-flop optical devices. Wavelength converters. Ultrafast optical switching

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises.

	Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory practice	10 hours
Essay writing	13 hours
Non-directed study	63 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	The final score for the course will be 75% from the final written exams and 30% from the laboratory exams. Attendance of the laboratory exercises is obligatory. Students will be evaluated through exams (oral or written) during each laboratory exercise. Final score for the laboratory part will result from the average performance of the laboratory exercises. For succeeding the exams, the score of the written exams should be at least 50/100. Successful examination of the laboratory part can be preserved for the following years. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Συστήματα επικοινωνιών με οπτικές ίνες, G. P. Agrawal, 4η έκδοση, Εκδόσεις Τζιόλα, 2016

S. Kumar and M. Jamal Deen, Fiber Optic Communications, Wiley, 2014Οπτολεκτρονική, Jasprit Singh, Εκδόσεις Τζιόλα, 2015.
L.N. Binh, Optical Fiber Communication Systems with MATLAB® and Simulink® Models, Second Edition, CRC Press, 2014
Fundamentals of Photonics, B.E.A. Saleh and M.C. Teich, Wiley, 2007
Photonics: Optical electronics in modern communications, Amnon Yariv, Pochi Yeh,sixth edition, Oxford University Press, 2007

COURSE OUTLINE Network analysis and simulation

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE		SEMESTER	8
COURSE TITLE	Network analysis and simulation		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	Special background		
PREREQUISITE COURSES:	Network Protocols and Architecture or Computer Networks.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek/English for Erasmus students.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
As a result of successfully completing this course, students will: Describe the main quantitative methods for performance evaluation of communication networks Explain the advantages and drawbacks of using simulation as a tool for analyzing communication. Describe common assumptions, simplifications, and generalizations made in modeling communication systems. Implement, verify and validate simulation models of communication networks. Evaluate simulation results.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to simulation concepts, discrete event simulation, input modeling, statistical analysis of simulation, computer networks simulation, Discrete time Markov chains (DTMC), Queuing models (M/M/1, M/M/c/k, M/G/1). Well-known network simulation packages such as OMNeT++. Simulation and performance analysis of communication networks. Tools and software for network simulation. Design, implementation, verification, and validation of simulation models for analyzing wired and wireless networks. Evaluation and presentation of simulation results.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use course’s webpage that keeps educational material of previous academic years and is updated every year.
Lectures typically use electronic presentations.
Students are divided in groups and perform laboratory exercises.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39 hours</td></tr>
<tr><td>Laboratory and project tutorial</td><td>10 hours</td></tr>
<tr><td>Project writing</td><td>26 hours</td></tr>
<tr><td>Non directed study</td><td>50 hours</td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Because of the importance of understanding both the theoretical and hands-on elements of special topics in networking, students must pass all the components of the course (laboratory, exams and projects) in order to receive a passing grade for the course.
The course grade will be based on:
Final exams (50%)
Laboratory exercises (20%)
Project (30%)
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Τεχνικές Προσομοίωσης, Ρουμελιώτης, Σουραβλάς, 2011,Εκδόσεις Τζιόλα, ISBN: 978-960-418-372-2.

Εργαστηριακά Μαθήματα στα Δίκτυα και Διαδίκτυα Υπολογιστών, Β. Τσαουσίδης, Ε. Μαμάτας, Ι. Ψαρράς, Ε. Κοσμίδης, Σ. Δημητρίου, 2010, Εκδόσεις Κλειδάριθμος, SBN: 9789604613861

Τεχνικές Προσομοίωσης, Ρουμελιώτης Μάνος-2008, Εκδόσεις Επίκεντρο, 978-960-6645-37-2

Simulation Modeling and Analysis, A. M. Law W. D. Kelton,, 1991, McGraw-Hill, Inc, ISBN-13: 978-0070366961 ISBN-10: 9780070366961

Computer Simulation Techniques - The Definitive Introduction, H. Perros, 2009. free download from https://people.engr.ncsu.edu/hp/files/simulation.pdf

Modeling and tools for network simulation. 2010, Wehrle K, Günes M, Gross J, editors. Springer Science & Business Media ISBN 978-3-642-12331-3

Network Modelling and Simulation : A Practical Perspective, Mohsen Guizani, Ammar Rayaes, Bilal Khan, Ala Al-Fuqaha 2010, John Wiley & Sons, ISBN-13: 978-0470035870.

Simulation in Computer Network Design and Modeling : Use and Analysis, (Hussein Al-Bahadili, 2012, IGI Global, ISBN-13: 978-1466601918, ISBN-10: 1466601914

Introduction to Network Simulator NS2, Teerawat Issariyakul , Ekram Hossain, 2010, Springer, Boston,ISBN: 978-0-387-71760-9

A comprehensive overview on different network simulators." Christhu, M. R., et al., 2013, International journal of engineering and technology (IJET) 5.1

- Related academic journals:

International Journal of Computer Networks (IJCN) : http://www.cscjournals.org/journals/IJCN/description.php

Computer Networks : https://www.journals.elsevier.com/computer-networks

International Journal of Computer Networks & Communications(CNCIJ): http://flyccs.com/jounals/CNCIJ/Home.html

COURSE OUTLINE Network Management

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Graduate			
COURSE CODE	800	SEMESTER	8	
COURSE TITLE	Network Management			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures			3	5
Exercises			1	
COURSE TYPE	Specialization			
PREREQUISITE COURSES:	-			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek/ English for Erasmus students			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	https://www.ce.teiep.gr/e-class/courses/800/			

LEARNING OUTCOMES

Learning outcomes
Upon completion of the course, students must be able to: Manage IPv4 addresses, TCP / UDP transfer protocols, ARP Cash Table. Organize networks in hierarchical subnetworks. Recognize the routing function as well as recognize the differences between vector distance and link state algorithms. Manage the domain name system and understand the structure and operation of DNS Servers Manage the DHCP Servers. Manage and understand the operation of the SNMP protocol Understand the structure of the MIB bases and the ASN.1 notation Operate in a network management center.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

The course teaches techniques used in network management, diagnostics, and network problem solving. The course covers IPv4 address management, hierarchical subnetting, CIDR addressing, Domain Name System (DNS) and DNS Servers operation, ARP Cache Table management and the utilization of the ICMP protocol for troubleshooting In addition. It teaches the routing operation and the differences between vector distance and link state algorithms. It explains the operation of the Dynamic Host Configuration Protocol (DHCP) Servers. Students are introduced to the operation of the Simple Network Management Protocol (SNMP), the structure of the Management Information Bases (MIBs) and the ASN.1 notation.

The course covers It explains the domain name system as well as the structure and operation of DNS Servers.. The laboratory section supplements the lectures with practical exercises. The students learn and experiment with network administrative commands and tools.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students are divided in groups and perform laboratory programming exercises. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Study	50 hours
Laboratory	23 hours
Project	23 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	The final grade for the course will be calculated as follows: 40% final examination, 20%, 1st Test 20% 2nd Test 10% from laboratory and 10% of the project Laboratory participation is optional. All students are required to hand one project. The Tests are optional for students. If the students fail the tests, then the final exam is accounted with a weight of 80%. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Kurose J. & Ross K. (2004): Δικτύωση Υπολογιστών (Προσέγγιση από Πάνω προς τα Κάτω με Έμφαση στο Διαδίκτυο) (μεταφρασμένο), Εκδόσεις Γκιούρδας.
2. Μήλιου Αμαλία Ν., Νικοπολιτίδης Πέτρος, Πομπόρτσης Ανδρέας Σ. (2007): Διαχείριση δικτύων υπολογιστών, Εκδόσεις Α. ΤΖΙΟΛΑ & ΥΙΟΙ
3. Guide to Managing and Troubleshooting Networks Lab Manual, Fifth Edition 5th Edition, McGraw-Hill Education; 5 edition (July 10, 2018), ISBN-13: 978-1260121209.
4. SNMP, SNMPv2, SNMPv3, and RMON 1 and 2 (3rd Edition) 3rd Edition by William Stallings, Addison-Wesley Professional;
Stallings W. (2003): Επικοινωνίες Υπολογιστών και Δεδομένων (μεταφρασμένο), Εκδόσεις Τζιόλα.
https://repository.kallipos.gr/handle/11419/900
Sudhir Dixit, Ramjee Prasad, Wireless IP and Building the Mobile Internet (Artech House Books, 2003)
Nathan Muller, LANs TO WANs: The Complete Management Guide, (Artech House Books, 2003)
Matthew Liotine, Mission-Critical Network Planning, (Artech House Books, 2003)
Freddy Ghys, Michel Smouts, Marcel Mampaey, Arto Vaaraniemi, 3G Multimedia
Network Services, Accounting and User Profiles (Artech House Books, 2003)
Nihal Kularatna, Dileeka Dias, Essentials of Modern Telecommunications Systems (Artech House Books, 2004)
Abeck, Sebastian. Network Management know it all. Morgan Kaufmann, 2009.
Joe Casad, Μάθετε το Μάθετε το TCP σε 24 ώρες (Μ. Γκιούρδας)

- Related academic journals:

International Journal of Network Management : https://onlinelibrary.wiley.com/journal/10991190

I) Internet based technologies flow

COURSE OUTLINE Technologies for Internet Applications

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE		SEMESTER	7
COURSE TITLE	Technologies for Internet Applications		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	special background		
PREREQUISITE COURSES:	Suggested courses: Internet Programming, Object-Oriented Programming		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding of the structure of internet applications that are mainly based on the HTTP protocol. Ability to develop internet applications by constructing dynamic web pages utilizing technologies such as Java Servlets and Java Server Pages or PhP. Understanding of the differences between client side programming versus server side programming, the technologies involved and their tradeoffs, Familiarization with applying application patterns such as MVC (Model/View/Controller).
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

The course presents technologies used for building internet applications by creating dynamic web pages. Overview of HTML and CSS. Java EE technologies such as Servlets and Java Server Pages or PhP. HTTP Requests and Responses. HTML Form Handling. Methods to preserve state (sessions, cookies, url rewriting). Database connectivity (JDBC). Model View Controller pattern. JavaScript DOM and Event Handling. Introduction to jQuery.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code.

	Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Programming exercises</td><td>13 hours</td></tr><tr><td>Laboratory programming tutorials</td><td>23 hours</td></tr><tr><td>Study</td><td>50 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other Specifically-defined evaluation criteria are given, and if and where they are accessible to students.	The final grade for the course will be calculated as 50% of the final examination, 50% of the laboratory exercises.

ATTACHED BIBLIOGRAPHY

[1] Servlets και Σελίδες Διακομιστή Java, Marty Hall, Larry Brown, Εκδόσεις Κλειδάριθμος
[2] Ανάπτυξη Web Εφαρμογών με PHP και MySQL, Luke Welling, Laura Thomson, Εκδόσεις Μ Γκιούρδας
[3] Murach's Java Servlets and JSP (3rd Edition), Joel Murach and Michael Urban, Mike Murach & Associates;
[4] Η Γλώσσα JavaScript (Νέα Έκδοση), Λιακέας Γιώργος, Εκδόσεις Κλειδάριθμος
[5] HTML5 και CSS3 Με Εικόνες, Elizabeth Castro, Bruce Hyslop, Εκδόσεις Κλειδάριθμος

COURSE OUTLINE E-Learning Systems

GENERAL

SCHOOL	Informatics and Telecommunications			
ACADEMIC UNIT	Informatics and Telecommunications			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE		SEMESTER	7	
COURSE TITLE	E-Learning Systems			
INDEPENDENT TEACHING ACTIVITIES			WEEKLY TEACHING HOURS	CREDITS
Lectures and Laboratory Exercises			3	5
Laboratory work			1	
COURSE TYPE	special background			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)				

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding the application of instructional design practices in developing e-learning content. Familiarization with modern learning theories and their impact in developing distance learning content. Familiarization of applying evidence based principles in developing e-learning content that enhance learning. Familiarization with using and administering Learning Management Systems such as moodle or Open eClass Understanding the utilization of different presentation activities and learning assessments.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to E-Learning or Distance Learning. Synchronous vs Asynchronous E-learning and MOOCs. Quick Instructional Design (Learning Objectives and Learning Objects). E-learning Principles (Multimedia, Contiguity, Redundancy, Coherence, Personalization etc). Tests. Games and Simulations. Administering Moodle. Moodle activities. Special Topics in HTML5, Authoring Tools and Multimedia Technologies.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years that is updated every year.

<table>
<tr><td></td><td>Lectures typically use electronic presentations, writing, executing and criticizing segments of code.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
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<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39 hours</td></tr>
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<tr><td>Study</td><td>50 hours</td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>The final grade for the course will be calculated as 50% of the final examination and 50% of the laboratory exercises.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

[1] E-learning by Design, William Horton, Pfeifer
[2] E-Learning and the Science of Instruction, R Clark & R Mayer, Pfeifer
[3] ΠΟΛΥΜΕΣΑ και ΕΚΠΑΙΔΕΥΣΗ, S Alessi and S Trolip, Εκδόσεις Μ Γκιούρδας
[4] Moodle Course Design Best Practices, S Nash & M Moore, Εκδόσεις Packt
[5] Εκπαιδευτική τεχνολογία για διδασκαλία και μάθηση, Newby Timothy J.,Stepich Donald A.,Lehman James D.,Russel James D. Εκδόσεις Επίκεντρο
[6] HTML and CSS: Design and Build Websites, Jon Duckett, John Willey and Sons
[7] Χρήση και Προγραμματισμός Πολυμέσων, Yue Ling Wong, Μ Γκιουρδας

COURSE OUTLINE Privacy Enhancing Technologies and Anonymity

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE		SEMESTER	7
COURSE TITLE	Privacy Enhancing Technologies and Anonymity		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	5
Laboratory work		1	
COURSE TYPE	specialized general knowledge		
PREREQUISITE COURSES:	IT Security		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	e-class		

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding of the basic concepts of privacy enhancing technologies (PET) Familiarization and ability to identify threats against privacy in an IT system, Familiarization and ability to explain and use basic terminology in the area correctly, Familiarization and ability to find and use documentation of privacy-related problems and technologies, Ability to demonstrate an overview of privacy enhancing technologies (PET), Familiarization and ability to analyze descriptions of PET systems with regard to their protection of privacy and function, Ability to identify vulnerabilities from PET system descriptions, predict their equivalent threat, and choose countermeasures against identified threats and show their efficiency, Ability to compare countermeasures and evaluate their side effects, Ability to present and explain their reasoning to others They can develop and implement secure distributed applications using blockchain technologies.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Definition of Privacy, Privacy Attacks and Subjectivity of Infringement, Anonymous, Minimal information disclosure, Unlinkability, Key binding, Pseudonyms, Identity Management, Anonymizer, LPWA, Onion Routing, Crowds , MixNets, etc.), privacy assurance mechanisms in (ubiquitous) computing environments (RFIDs, Localization Services), application development in Ethereum and solidity

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of the course’s webpage that keeps educational material of previous academic years which is updated every year.
Lectures typically use electronic presentations, writing, executing and criticizing segments of code.
Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39 hours</td></tr>
<tr><td>Laboratory work</td><td>13 hours</td></tr>
<tr><td>Project</td><td>25 hours</td></tr>
<tr><td>study and analysis of bibliography</td><td>8 hours</td></tr>
<tr><td>Study</td><td>40 hours</td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Students must complete a project assigment (30%).
Students must participate in final term exams (70%).
Successful delivery of Project assignment is prerequisite for participating to final exam.
Evaluation criteria are accessible to the students at the beginning of the semester through the course’s web page.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Προστασία της Ιδιωτικότητας και Τεχνολογίες Πληροφορικής και Επικοινωνιών- Γκρίτζαλης Στέφανος, Λαμπρινουδάκης Κωνσταντίνος, Κάτσικας Σωκράτης, Μήτρου Λ.- 9762- Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε.

- Related academic journals:

“Anonymity, Unlinkability, Undetectability, Unobservability, Pseudonymity, and Identity Management – A Consolidated Proposal for Terminology”, Andreas Pfitzmann and Marit Hanse

“Privacy-enhancing Technologies for the Internet”, I. Goldberg, D. Wagner, E. Brewer, IEEE Spring COMPCON, 1997.

“Privacy-enhancing technologies for the Internet, II: Five years later”, Ian Goldberg, PET 2002.

“Privacy-enhancing technologies for the Internet III: Ten years later”,Ian Goldberg, “Digital Privacy: Theory, Technologies and Practices", Alessandro Acquisti, Stefanos Gritzalis, Costas Lambrinoudakis, and Sabrina De Capitani di Vimercati, editors, 2007

“Untraceable electronic mail, return addresses, and digital pseudonyms”, David Chaum, Communications of the ACM, 1981

Tor: The Second-Generation Onion Router”, Roger Dingledine, Nick Mathewson, Paul Syverson, USENIX Security, 2004. ·

“HORNET: High-speed Onion Routing at the Network Layer”, Chen Chen, Daniele Enrico Asoni, David Barrera, George Danezis, Adrian Perrig, ACM CCS, 2015.

“The Parrot is Dead: Observing Unobservable Network Communications”, Amir Houmansadr, Chad Brubaker, Vitaly Shmatikov, Oakland Security and Privacy (S&P), 2013.

“TapDance: End-to-Middle Anticensorship without Flow Blocking”, E Wustrow, CM Swanson, JA Halderman, USENIX, 2014.

“Vanish: Increasing Data Privacy with Self-Destructing Data”, Roxana Geambasu, Tadayoshi Kohno, Amit A. Levy, Henry M. Levy, USENIX Security, 2009.

“Defeating Vanish with Low-Cost Sybil Attacks Against Large DHTs”, Scott Wolchok, Owen S. Hofmann, Nadia Heninger, Edward W. Felten, J. Alex Halderman, Christopher J. Rossbach, Brent Waters, Emmett Witchel, NDSS, 2010.

“De-anonymizing Social Networks”, Arvind Narayanan, Vitaly Shmatikov, Oakland Security and Privacy (S&P), 2009 ·

"Community-Enhanced De-anonymization of Online Social Networks", S Nilizadeh, A Kapadia, YY Ahn, ACM CCS, 2014. ·
"LinkMirage: Enabling Privacy-preserving Analytics on Social Relationships", C Liu, P Mittal, NDSS, 2016.
On the Computational Practicality of Private Information Retrieval", Radu Sion, Bogdan Carbunar, NDSS, 2007. ·
"M2R: Enabling Stronger Privacy in MapReduce Computation", A Dinh, P Saxena, EC Chang, BC Ooi, C Zhang, USENIX, 2015.
"Adnostic: Privacy Preserving Targeted Advertising", Vincent Toubiana, Arvind Narayanan, Dan Boneh, Helen Nissenbaum, Solon Barocas, NDSS, 2010.
"Privacy-Aware Personalization for Mobile Advertising", Michaela Hardt and Suman Nath, ACM CCS, 2012
"Preserving privacy in GPS traces via uncertainty-aware path cloaking", B. Hoh, M. Gruteser, H. Xiong, and A. Alrabady. ACM CCS, 2007.
"Quantifying Location Privacy", Reza Shokri, George Theodorakopoulos, Jean-Yves Le Boudec, Jean-Pierre Hubaux. Oakland Security and Privacy (S&P), 2011

COURSE OUTLINE Web and database application development

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	700	SEMESTER	7
COURSE TITLE			

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory work	1	

COURSE TYPE	special background
PREREQUISITE COURSES:	Object-oriented programming (required) Databases 1 (required) Software engineering (advised)
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes
Autonomous work
General Competences
Students get theoretical and practical background in analysis, design, and implementation in complex web applications, in advanced topics of object-oriented programming principles, and patterns, and object-relational mapping. Server-side programming, using a framework, such as Java EE.

SYLLABUS

Web application categories, applications with presentation emphasis and sevices.
Web application architecture: database, middle, and client tiers. Presentation business logic and model sub-tiers of middle tier. Application and database servers.
Introduction to Java EE, Java EE server and containers. Introduction to JavaServer Faces, CDI managed beans, Expression Language, Enterprise Java session Beans, Java Persistence, Java Transactions.
Presentation tier and JSF, lifecycle, conversion and validation, events, using Ajax.
Object-relational mapping and JPA.
Analysis and design methods, object-oriented principles. Programming patterns.
Development of demo application (software requirements, analysis and design, implementation using server-side programming and Java EE framework.
Optional instructor-guided home application development project.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's website, instructor's notes Use of IDE, Java EE framework Students communicate with the instructor using emails and the the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Laboratory work	13 hours

	Study	73 hours
	Course total	125 hours
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other Specifically-defined evaluation criteria are given, and if and where they are accessible to students.	Final written exam. Optional instuctor-guided home application development project and presentation.	

ATTACHED BIBLIOGRAPHY

Goncalves, A. (2013) "Beginning Java EE 7", Apress.
Oracle (2014) “Java Platform, Enterprise Edition, The Java EE Tutorial, Release 7, E39031-01”.
Geary, D., Horstmann, C.S. (2010) "Core JavaServer Faces", 3rd edition, Pearson Education.
Keith M., Schincariol M., Nardone M. (2018) "Pro JPA 2 in Java EE 8: An In-Depth Guide to Java Persistence API", 3rd edition, Apress.
Vasiliev (2008) "Beginning Database-Driven Application Development in Java EE Using GlassFish", Apress.
Scholtz B. (2018) "The Definitive Guide to JSF in Java EE 8: Building Web Applications with JavaServer Faces", Apress.
Martin, R.C (2002) "Agile Software Development, Principles, Patterns, and Practices", Prentice Hall.
Gamma E., Helm R., Johnson R., Vlissides J. (1995) "Design Patterns, Elements of Reusable Object Oriented Software", Addison Wesley.
Teorey, T., Lightstone, S., Nadeau, T., Jagadish, H.V. (2011) "Database Modeling and Design, Logical Design, 5th edition", Morgan Kaufmann Publishers - Elsevier.

COURSE OUTLINE Programming in mobile devices

GENERAL

SCHOOL			Informatics and Telecommunications
ACADEMIC UNIT			Informatics and Telecommunications
LEVEL OF STUDIES			Graduate
COURSE CODE		SEMESTER	
COURSE TITLE			Programming in mobile devices
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDIT
Lectures		3	5
Laboratory work		1	
COURSE TYPE			special background
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:			Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
IS THE COURSE OFFERED TO ERASMUS STUDENTS			Yes
ΗΛΕΚΤΡΟΝΙΚΗ ΣΕΛΙΔΑ ΜΑΘΗΜΑΤΟΣ (URL)			

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Developing mobile applications in Android devices
General Competences The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Activities, Layous, Buttons, TextViews, ListViews, Databases in Sqlite, Gps and sensors, Network programming, Fragments, Augmented reality

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.

TEACHING METHODS	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 hours</td></tr><tr><td>Laboratory projects</td><td>13 hours</td></tr><tr><td>Project</td><td>20 hours</td></tr><tr><td>HomeWork</td><td>53 hours</td></tr><tr><td>Course total</td><td>125 hours</td></tr></table>
STUDENT PERFORMANCE EVALUATION	Students must complete four p programming projects during the semester (40%). Students must complete a team project (60%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

Android για προγραμματιστές, Harvey M. Deitel, Paul J. Deitel, Abbey Deitel, Michael Morgano, 2012, Εκδόσεις Γκιούρδας Μ., ISBN: 978-960-512-639-1.
Εισαγωγή στον προγραμματισμό Android, Ν. Ι. Έλληνας, Ι. Ν. Έλληνας, 2014, Εκδόσεις Τζιόλα, ISBN: 978-960-418-453-8.
Κινητός Ιστός - Κινητές Εφαρμογές στην Πλατφόρμα Android – Επαυξημένη Πραγματικότητα, Δαμιανός Γαβαλάς, Βλάσης Κασαπάκης, Θωμάς Χατζηδημήτρης, 2015, εκδόσεις Νέων Τεχνολογιών, ISBN978-960-578-007-4.

COURSE OUTLINE Electronic Commerce

GENERAL

SCHOOL			Informatics and Telecommunications
ACADEMIC UNIT			Informatics and Telecommunications
LEVEL OF STUDIES			Graduate
COURSE CODE		SEMESTER	
COURSE TITLE			Electronic Commerce
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDIT
Lectures		3	5
Laboratory work		1	
COURSE TYPE			special background
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:			Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
IS THE COURSE OFFERED TO ERASMUS STUDENTS			Yes
ΗΛΕΚΤΡΟΝΙΚΗ ΣΕΛΙΔΑ ΜΑΘΗΜΑΤΟΣ (URL)			

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding of the main principles of E-commerce Installation of web servers Developing web sites using the PHP language Installation of CMS frameworks
General Competences The general competences that are acquired upon completion of the course are:

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Project planning and management
Criticism and self-criticism
Production of free, creative and inductive thinking

SYLLABUS

B2B, B2C, EDI, web servers, apache installation, programming in Javascript and PHP, Wordpress, Drupal.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year. Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Students must complete four p programming projects during the semester (40%). Students must complete a team project (60%). Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

Activity	Semester workload
Lectures	39 hours
Laboratory projects	13 hours
Project	20 hours
HomeWork	53 hours
Course total	125 hours

ATTACHED BIBLIOGRAPHY

Μάθετε PHP, MySQL και Apache Όλα σε Ένα, 5η Έκδοση, Melonie Julie C., 2014, Εκδόσεις Χ. ΓΚΙΟΥΡΔΑ και ΣΙΑ ΕΕ, ISBN978-960-512-6551.
Ηλεκτρονικό εμπόριο, Αρσένης Πασχόπουλος και Παναγιώτης Σκαλτσάς, 2006, Κλειδάριθμος, SBN 960-209-988-7, ISBN-13 978-960-209-988-9.
Πλήρες Εγχειρίδιο HTML 5, CSS και JavaScript 7η Έκδ., Colburn Rafe, Jennifer Kyrnin, Laura Lemay, 2016, Εκδόσεις Μ. Γκιούρδας, ISBN: 978-960-512-696-4.
Μάθετε το WordPress 4x, Γιώργος Μπίκας, 2015, Εκδότης: Κλειδάριθμος , ISBN: 9789604616800.
Οπτικός οδηγός του Drupal 7, Tom Geller, 2012, Εκδότης: Γκιούρδας Μ., ISBN: 978-960-512-636-0.

COURSE OUTLINE Virtual Reality

GENERAL

SCHOOL	Informatics and Telecommunications		
ACADEMIC UNIT	Informatics and Telecommunications		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	800	SEMESTER	8
COURSE TITLE	Virtual Reality		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	3	5
Laboratory work	1	

COURSE TYPE	special background
PREREQUISITE COURSES:	No PREREQUISITE COURSES
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	e-class

LEARNING OUTCOMES

Learning outcomes
The learning outcomes that the course achieves are: Understanding of the foundations and basic concepts of virtual reality and augmented reality, Familiarization and ability to be aware of the possibilities, uses and applications of Virtual Reality technologies and augment reality Familiarization and ability to present existing VR technologies and methodologies, but also explain their use, operation and their expansion Familiarization and ability to use software tools for developing virtual reality applications as well as augmented reality. Familiarization and ability to implement virtual reality environments and augmented reality environments and to demonstrate them into real applications in education, culture, arts and entertainment.
General Competences
The general competences that are acquired upon completion of the course are: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Working independently Team work Project planning and management Criticism and self-criticism Production of free, creative and inductive thinking

SYLLABUS

Introduction to the principles/ foundations of Virtual Reality and Augmented Reality, comparisons and differences. Principles of human visual system, the 3D world and the creation of 3D environment (Requirements and needs, Input Devices & Output Devices.) Lighting. Geometry of virtual worlds. Virtual Reality Environment Planning, systems and technologies for designing a virtual reality environment. 3D user interfaces, virtual reality modeling, virtual reality programming Embedding issues, human factor in virtual reality. Case Study and Virtual Reality Apps. Design and development of virtual reality applications using mobile devices.. Case Study and Enhanced Reality Applications.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of the course's webpage that keeps educational material of previous academic years which is updated every year.

	Lectures typically use electronic presentations, writing, executing and criticizing segments of code. Students communicate with the instructor using emails and the discussion forum of the course as provided by the e-class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	39 hours
Fieldwork for Project Assigment	8 hours
Project	20 hours
Study	45 hours
Course total	125 hours

STUDENT PERFORMANCE EVALUATION	Students must complete 3 project assigments (40%). Students must participate in final term exams (60%). Students can participate in mid-term written exams in order to get a bonus complementary grade to their final exam. Students are informed for the evaluation criteria at the beginning of the semester at the 1st lecture. Evaluation criteria are accessible to the students at the beginning of the semester through the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Φωκίδης Ε., & Τσολακίδης Κ. (2011). Εικονική πραγματικότητα στην εκπαίδευση: Θεωρία και πράξη. Αθήνα: Εκδόσεις Διάδραση.

Κωνσταντίνος Μουστάκας, Ιωάννης Παλιόκας, Δημήτριος Τζοβάρας, Αθανάσιος Τσακίρης, Γραφικά και Εικονική Πραγματικότητα, ΣΕΑΒ, 2016, ISBN: 78-960-603-255-4

Λέπουρας, Γ., Αντωνίου, Α., Πλατής, Ν., Χαρίτος, Δ., 2015. Ανάπτυξη συστημάτων εικονικής πραγματικότητας. [ηλεκτρ. βιβλ.] Αθήνα: Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Διαθέσιμο στο: http://hdl.handle.net/11419/2546

- Related academic journals:

Gerard Jounghyum. Designing virtual reality systems : the structured approach. London: Springer, c2005.

Kipper, Gregory. Augmented reality : an emerging technologies guide to AR. Amsterdam ; Waltham, MA : Syngress, c2013.

Steven M. LaValle, Virtual Reality, 2016. Διαθέσιμο: http://msl.cs.uiuc.edu/vr/