Department of Computer Science and Engineering
University of Ioannina

Undergraduate Programme:
Outlines of Core Courses

ACADEMIC YEAR 2026-2027

Undergraduate Programme: Core Courses

MYY101 English for Computer Science I

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**MYY101**	**SEMESTER**	**1**	
COURSE TITLE	English for Computer Science I			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures / Labs / Tutorials		**3**	**2**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized General Knowledge/Skills Development			
PREREQUISITE COURSES:	None			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No			
COURSE WEBSITE (URL)	https://ecourse.uoi.gr/course/view.php?id=470			

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

STUDENTS ARE EXPECTED:

1. **TO UNDERSTAND INTRODUCTORY TEXTBOOK MATERIAL IN THEIR SCIENTIFIC FIELD**
2. **TO UNDERSTAND AND REPRODUCE SPECIALIZED DISCOURSE IN THEIR SCIENTIFIC FIELD**
3. **TO DEFINE AND CLASSIFY SCIENTIFIC CONCEPTS**
4. **TO DESCRIBE PROCESSES AND GRAPHS**
5. **TO HAVE ACQUIRED KNOWLEDGE AS TO HOW ENGLISH GRAMMAR IS USED IN ACADEMIC CONTEXT**

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and *Project planning and management*

information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- *SEARCH FOR ANALYSIS AND SYNTHESIS OF DATA AND INFORMATION WITH THE USE OF NECESSARY TECHNOLOGY*
- *WORKING INDEPENDENTLY*
- *PRODUCTION OF FREE, CREATIVE AND INDUCTIVE THINKING*

SYLLABUS

English for Computer Science I	
Terminology	Computer Systems, Boolean Operations, Truth tables, Memory Systems, Magnetic, Optical and Solid-state Storage, Peripheral devices, the CPU, Operating Systems
Academic Grammar	The Use of Tenses in Academic English, Noun Phrases, The Use of the Article, Hedging Language
Academic Writing	Definitions, Language for Classification and Listing, Process Description and Graph Description

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	1) FACE-TO-FACE 2) DISTANCE LEARNING VIA THE MOODLE PLATFORM ON THE ECOURSE SERVICE OF THE UNIVERSITY OF IOANNINA
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• USE OF ITC IN TEACHING (VIDEOS, POWERPOINT PRESENTATIONS, EDUCATIONAL GAMES) • USE OF ICT IN COMMUNICATION WITH STUDENTS VIA THE MOODLE PLATFORM AND EMAIL
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*	

Activity	***Semester workload***
Lectures	13*3 = 39 hours
Self-Study	26 hours
Course total	***65 hours***

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.*	LANGUAGE OF EVALUATION: ENGLISH EVALUATION METHOD: • 4 WRITTEN ASSIGNMENTS DURING THE SEMESTER (OPTIONAL) • WRITTEN EXAM (MULTIPLE CHOICE QUESTIONS, SHORT-ANSWERS, GAP FILLING, READING COMPREHENSION EXERCISES, WRITING) (COMPULSORY) EVALUATION CRITERIA: KNOWLEDGE OF THE TAUGHT TERMINOLOGY/ ACQUISITION OF BASIC SKILLS IN ACADEMIC WRITING/ACQUISITION OF ACADEMIC GRAMMAR DELIVERABLE: VIA THE ECOURSE SERVICE

ATTACHED BIBLIOGRAPHY

Βιβλίο [10686]: University Writing Course Student's Book with answers, Morley John,Doyle Peter,Pople Ian

Βιβλίο [86195605]: ACADEMIC ENGLISH FOR COMPUTER SCIENCE, RIZOPOULOU NONI

MYY102. Calculus I

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY102**	**SEMESTER**	**1st**
COURSE TITLE	Calculus I		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	5	5,5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=1379

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

After successfully completing this course, students will be able to:

- examine the convergence of sequences and series of real numbers and power series,
- calculate the values of infinite sums,
- graph and understand the properties of functions of one real variable,
- differentiate parametric and implicit forms of functions,
- identify tangent lines on curves described in different ways,
- calculate definite, indefinite and generalized integrals,
- use transformations to polar coordinates,
- calculate areas and lengths of curves,
- approximate functions with polynomials,

- understand basic concepts of complex numbers and differential equations.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Criticism and self-criticism
- Production of free, creative and inductive thinking

SYLLABUS

Real numbers (body and order axioms, closed sets, the concept of supremum and infimum). Functions of one real variable (parametric, monotonous, inverse, trigonometric, logarithmic, exponential, hyperbolic). Sequences, Series. Limits. Continuous functions. Differentiation (definition, differentiation of known functions, physical and geometrical interpretation, properties, Rolle's theorem, mean value theorem, de l Hospital's rule). Applications of derivatives (rate of change, graphs of functions). Taylor's theorem. Indefinite integral, techniques of integration (integration of known functions, integration by parts, method of substitution). Definite integral. Applications of integrals (areas, arc length, volume of revolution). Complex numbers (definition, operations, interpretation), polar form of complex, Euler's formula, roots of unity, elementary complex functions (powers, exponential function, trigonometric functions, logarithm and roots), trinomials. Ordinary differential equations (the concept of a differential equation, initial conditions, equations of separable variables, general linear equation of the first degree, linear equations with constant coefficients, Riccati equation).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In class
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	
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*	

Activity	*Semester workload*
Lectures	13*5 = 65 hours
Self-study	85 hours

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*		
	Course total	***150 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.*	Written exam	

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Book [77109719]: Απειροστικός λογισμός, Briggs William, Cochran Lyle, Gillett Bernard

Book [77107082]: THOMAS ΑΠΕΙΡΟΣΤΙΚΟΣ ΛΟΓΙΣΜΟΣ, [George B. Thomas], Jr., Joel Hass, Christopher Heil, Maurice D. Weir

Book [94644183]: ΜΑΘΗΜΑΤΙΚΑ ΓΙΑ ΕΠΙΣΤΗΜΟΝΕΣ ΚΑΙ ΜΗΧΑΝΙΚΟΥΣ - ΤΟΜΟΣ 1, LOTHAR PAPULA Λ

Book [77121321]: Εφαρμοσμένα Μαθηματικά, Θεοδώρου Αθανάσιος

Book [213]: ΔΙΑΦΟΡΙΚΟΣ ΚΑΙ ΟΛΟΚΛΗΡΩΤΙΚΟΣ ΛΟΓΙΣΜΟΣ, SPIVAK MICHAEL

Book [68369901]: Λογισμός Συναρτήσεων μιας Μεταβλητής και Γραμμική Άλγεβρα, 2η Έκδοση, Μυλωνάς Νικόλαος, Σχοινάς Χρήστος, Παπασχοινόπουλος Γ.

Book [45322]: Απειροστικός Λογισμός, ΤΟΜΟΣ Ι, Νεγρεπόντης Στυλιανός, Γιωτόπουλος Σ. Χ., Γιαννακούλιας Ευστάθιος

Book [68375438]: Μαθηματικά Ι β έκδοση, Ρασσιάς Θ.

Book [**50659150**]: Αρχές Μαθηματικής Αναλύσεως, Rudin Walter

Book [**50659155**]: Απειροστικός Λογισμός Τόμος Α, Ντούγιας Σωτήρης

Book [**50659156**]: Απειροστικός Λογισμός Τόμος Β, Ντούγιας Σωτήρης

MYY103. General Physics

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERINGS		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY103**	**SEMESTER**	**1**
COURSE TITLE	**General Physics**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**5/0/0**	**5,5**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=432

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course provides an understanding of basic principles and laws of electromagnetism by applying them to a number of problems and questions.
After completion of the course, the students will have comprehended the contribution of electromagnetism to our modern technological civilization. This will be done by understanding how the basic principles and laws of electromagnetism apply on simple electric devices, but also on more complex ones such as mass spectrometers, oscilloscopes, computers etc. In addition, they will have understood the close interplay between physics

and computers.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

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* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- 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 modelling of complex problems
- Algorithmic thinking
- Rough estimation and comparison of basic physical quantities

SYLLABUS

Mathematical background, three-dimensional space, application of calculus to physics. Electromagnetism: Basic principles and laws. Electric charge, force and field. Electric potential, energy and power. Electric current and simple DC circuits. Magnetic field and force on moving charge. Induction and circuits of alternating current. Maxwell's equations and electromagnetic radiation.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector and interactive board during lectures. • Course website maintenance. Announcements and posting of teaching material (lecture slides and notes). • Announcement of assessment marks via the *ecourse* platform by UOI. • Use of email for information exchange and improved communication with students.
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*	

Activity	***Semester workload***
Lectures	13*4 =52 hours
Self-study	85 hours

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*	Tutorials	13*1 =13 hours
	Course total	**150 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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION: Final written examination, with problem solving. The evaluation procedure is accessible to students via the course website.	

ATTACHED BIBLIOGRAPHY

-Προτεινόμενη Βιβλιογραφία :

Book [112690846]: Πανεπιστημιακή φυσική με σύγχρονη φυσική, Young H., Freedman R.
Book [22750112]: ΦΥΣΙΚΗ ΓΙΑ ΕΠΙΣΤΗΜΟΝΕΣ ΚΑΙ ΜΗΧΑΝΙΚΟΥΣ: ΗΛΕΚΤΡΙΣΜΟΣ ΚΑΙ ΜΑΓΝΗΤΙΣΜΟΣ, ΦΩΣ ΚΑΙ ΟΠΤΙΚΗ, ΣΥΓΧΡΟΝΗ ΦΥΣΙΚΗ, RAYMOND A. SERWAY, JOHN W. JEWETT
Book [102076627]: Φυσική για Επιστήμονες και Μηχανικούς. Τόμος Β'. Ηλεκτρικό-Μαγνητικό Πεδίο. Σύγχρονη Φυσική, Randall D. Knight (Επιμ: Σιδερής Ευστ., Μουτής Νικ.)
Book [102075360]: Φυσική:Βασικές αρχές, Halliday David, Resnick Robert,Walker Jearl(Γενική επιστ.επιμ. Στυλιάρης Ευστάθιος)
Book [86055468]: Θεμελιώδης πανεπιστημιακή φυσική, Wolfson Richard (Συγγρ.) - Κατσικίνη Μαρία, Κουνάβης Παναγιώτης, Κουσουρής Κωνσταντίνος (Επιμ.)
Book [94644735]: ΒΑΣΙΚΕΣ ΑΡΧΕΣ ΦΥΣΙΚΗΣ, R. SHANKAR

-Συναφή επιστημονικά περιοδικά:

MYY104. Linear Algebra

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPT. OF COMPUTER SCIENCE & ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY104**	**SEMESTER**	**1st**
COURSE TITLE	**LINEAR ALGEBRA**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	5 / 0 / 0	5.5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=1347

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Linear Algebra is a major branch of Mathematics. The main objects of study are linear vector spaces and linear mappings. It also includes key topics such as matrices, determinants, and linear systems. Although theoretically self-contained, Linear Algebra constitutes a key tool in various scientific fields such as Applied Mathematics, Natural Sciences, Computer Science and Engineering, Economics and Management Science etc.

After successful completion of this course, students are expected to be able to:

- Manipulate vectors and matrices and perform basic procedures such as matrix inversion and computation of determinants.
- Solve systems of linear equations.

- Compute eigenvalues and eigenvectors of matrices.
- Manipulate vector spaces and linear mappings.
- Understand the relationship between matrices and linear mappings.
- Perform equivalence and similarity transformations of matrices.
- Apply these concepts and procedures in applications where Linear Algebra problems arise.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking.
- Decision-making.
- Search for, analysis and synthesis of data and information.
- Development of algorithmic thinking.
- Ability of analyzing and modeling problems.

SYLLABUS

Matrices: Introduction and basic definitions. Elementary transformations and matrix operations. Inverse matrix.

Determinants: Laplace expansion. Determinants and elementary transformations. Existence and computation of inverse matrix. Method of adjugate matrix.

Linear Systems: Definitions and properties of linear systems. Augmented matrix and reduced row echelon forms. Gauss elimination and Cramer's rule. Rank of matrix. Solution of parametric linear systems.

Linear vector spaces: Definitions, properties, and subspaces. Linear dependence and independence. Basis and dimension of vector space. Linear mappings. Change of basis, inner product, and orthogonality.

Matrix characteristic values and vectors – Normal forms: Eigenvalues, eigenvectors, eigenspaces. Matrix polynomials. Diagonalization.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Weekly lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of lecture slides. • Course webpage where literature and free material is provided. • Use of the asynchronous tele-education services of University of Ioannina. • Use of email services and social media for

	communication with the students.

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

Activity	***Semester workload***
Lectures	13*5 = 65 hours
Self-study	85 hours
Course total	***150 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.

LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION: Final written examination based on full essay questions.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [31174]: ***Γραμμική Άλγεβρα: Θεωρία και Εφαρμογές***, Γ.Σ. Δονάτος, Μ.Χ. Αδάμ, Εκδόσεις Gutenberg, 2008.

Book [59364446]: Γραμμική Αλγεβρα 2η εκδοση, Παντελίδης Γ. Κραββαρίτης Δ. Νασόπουλος Β. Τσεκρέκος Π

Book [102074431]: ΓΡΑΜΜΙΚΗ ΑΛΓΕΒΡΑ ΚΑΙ ΕΦΑΡΜΟΓΕΣ, STRANG GILBERT, Εκδόσεις Παν.Κρήτης, 2021

- Related academic journals:

- Linear Algebra and its Applications, ELSEVIER.
- Journal of Computational and Applied Mathematics, ELSEVIER.
- Numerical Linear Algebra with Applications, WILEY.
- SIAM Journal on Matrix Analysis and Applications, SIAM.

MYY105. Introduction to Programming

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY105**	**SEMESTER**	**1**
COURSE TITLE	Introduction to Programming		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**6(3,2,1)**	**6**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=489

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course aims at introducing to students the philosophy of programming and at giving them the ability to program for the first time.

After successfully passing this course the students will be able to:

- Write simple or complex programs
- Verify the correctness and appropriateness of a given program
- Debug programs
- Understand basic programming concepts, structures and techniques
- Conduct simple and complex arithmetic computations via programming
- Use control flow constructs, conditions, decision structures and loops

- Design programs with the help of algorithm design tools and control flow diagrams
- Structure their programs with the help of iterative and recursive functions
- Program basic operations on data, such as searching and sorting
- Learn more sophisticated programming languages and concepts such as object-oriented programming

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Analysis of requirements for problem solving
- Algorithmic thinking
- Abstraction ability for problem modeling
- Working independently
- Team work

SYLLABUS

Introduction to Programming: programming languages, compiling, machine code, philosophy of programming, categories of programming languages.
Basic data structures: data types, numbers, strings, lists and arrays, sets, hash structures (dictionaries).
Control flow: Control flow using if, conditions, comparison operators, comparison of strings and sequences, boolean operators, looping using while and for, break and continue, nested loops.
Functions: commenting, parameters, assignment of values to parameters, programm structuring, locality of parameters, pass by value/reference, variable scope, recursive functions, program stack.
Searching and Sorting: Linear search, binary search, selection sort, bubble sort, insertion sort, merge sort.
Files: files, opening files, reading and writing, random access, loops in files, closing and flushing.
Errors and exceptions: Error types, exceptions, catching exceptions, exceptions and functions, debugging.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, lab sessions

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Use of ICT in teaching, laboratory education, communication with students

- Use of projector and interactive board during lectures.
- Use of computer for demonstation of programming.
- Use of computers in laboratories for development and testing of programs.
- Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs).
- Announcement of assessment marks via the ecourse platform by UOI.
- Use of email and social media for information exchange and improved communication with students.

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

Activity	***Semester workload***
Lectures	13*4 = 52 hours
Labs	11*2 = 22 hours
Self-study	76 hours
Course total	***150 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.

LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION

(i) Final examination, which includes questions of program development and testing. The exam papers are evaluated based on the correctness and completeness of answers.
(ii) Laboratory exercises of program development and testing. The students are evaluated based on whether they managed to write and test correctly the requested programs within the given time.
(iii) Take-home programming assignments. The assignments are marked based on their correctness and completeness.

The evaluation procedure is accessible to students via the course website.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [122084640]: Μαθαίνοντας προγραμματισμό με την Python, Νίκος Μαμουλής

- Related academic journals:

- Science of Computer Programming, ELSEVIER.
- ACM Transactions on Programming Languages and Systems (TOPLAS).

MYY106. Introduction to Computer Science

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERINGS		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY106**	**SEMESTER**	**1**
COURSE TITLE	Introduction to Computer Science		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**6**	**5.5**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=276

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.
Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The aim of the course is to introduce the main components of a computing system, its organization and the underlying technologies. The course also aims to introduce Unix, HTML/CSS, and LaTex.

On successfully completing the course, a student should be able to:

- Demonstrate an understanding of basic concepts of Computer Science (such as binary data representation, abstraction, compilation, ...)
- Describe in broad terms how a computer is organized and how it operates.
- Use basic Linux tools/application effectively.
- Handle files and directories using shell commands.
- Seek and understand technical information in manuals and the web.

- Write short scripts in order to automate simple tasks.
- Develop simple web pages using HTML/CSS, and basic documents using LaTeX.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

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* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Team work
- Production of free, creative and inductive thinking
- Abstraction ability for problem modeling
- Algorithmic thinking

SYLLABUS

Introduction to computer systems: Computer structure, abstraction layers, interfaces, main components, CPU, memory, hardware-software interface, basic peripherals, input-output, embedded computers, algorithm, machine language, programming languages, compiler/interpreter, languages and machines, process/task.

Introduction to computer networks: Distributed systems, client-server model, data transmission, digital signal, multiplexing, network types, transmission throughput, bandwidth, protocols and standards, addressing, TCP/IP, DNS, e-mail.

Introduction to the data representation: The bit, natural numbers, simple operations, overflow, negative numbers, conversion between data types, binary data and memory, endianess, shift, logical operations, masks, hexadecimal numbers, real numbers, characters, analog to digital data, digitization.

Introduction to digital circuits: Integrated circuits, transistor, inverter, logical operations, Boolean algebra, multiplexer, addition, subtraction, circuit design, memory circuit, finite state machine, memory circuit technologies.

Introduction to the processor organization: Registers, memory access, branches and loops, subroutine calls, datapath design, microprogramming, structure of the computer, microarchitecture, pipelining, multi/hyper threading, multiprocessing.

Introduction to UNIX: History, login/logout, file system, users and groups, file permissions, basic commands, I/O, filters, links, file management, archiving, printing, special characters, jobs.

The WWW – HTML/CSS: WWW services, history, addresses, client-server model, web

servers, browsers, HTML, tags, links, lists, images, tables, frames, CSS, classes, grouping, external CSS, fonts, colors, text, embedded CSS.

Introduction to LaTeX: The work environment, special characters, commands, file types, file structure, mathematical expressions, lists, bibliography, environments, arrays/tabular, labels.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, lab courses
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector and interactive board during lectures. • Course website maintenance. Announcements and posting of teaching material (lecture slides and notes). • Moodle CMS is used for self-assessment and lab quizzes. • Use of computers in laboratories. • Announcement of assessment marks via the ecourse platform by UOI. • Use of email for information exchange and improved communication with students.
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*	
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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final examination, which includes multiple choice questionnaires. (ii) Laboratory exercises, which include multiple choice questionnaires. The evaluation procedure is accessible to students via the course website.

Activity	***Semester workload***
Lectures	13*4 = 52 hours
Labs	8*2 = 16 hours
Self-study	82 hours
Course total	***150 hours***

ATTACHED BIBLIOGRAPHY

-Προτεινόμενη Βιβλιογραφία :

Book [112691202]: Επιστήμη υπολογιστών, Dale Nell, Lewis John (Συγγρ.) - Κατσάνος Χρήστος, Παπαδημητρίου Παναγιώτης, Σαμαράς Νικόλαος, Τσιάτσος Θρασύβουλος (Επιμ.)
Book [122075006]: Forouzan, B., "Εισαγωγή στην Επιστήμη των Υπολογιστών", Κλειδάριθμος, 2015.
Book [50656007]: Μποζάνης Παναγιώτης Δ., "Εισαγωγή στην Πληροφορική και τους Υπολογιστές" , ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε, 2016
Book [122077484]: Εισαγωγή στα Λειτουργικά Συστήματα και το UNIX - LINUX, 2η Έκδοση, Σιδηρόπουλος Αντώνης.

-Συναφή επιστημονικά περιοδικά:

- IEEE Computer Architecture Letters.
- *IEEE Transactions on Computers.*

MYY201 English for Computer Science II

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**MYY201**	**SEMESTER**	**2**	
COURSE TITLE	English for Computer Science II			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures / Labs / Tutorials		**3**	**3**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized General Knowledge/Skills Development			
PREREQUISITE COURSES:	None			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No			
COURSE WEBSITE (URL)	https://ecourse.uoi.gr/course/view.php?id=370			

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

STUDENTS ARE EXPECTED:

- **TO UNDERSTAND INTRODUCTORY TEXTBOOK MATERIAL IN THEIR SCIENTIFIC FIELD**
- **TO UNDERSTAND AND REPRODUCE SPECIALIZED DISCOURSE IN THEIR SCIENTIFIC FIELD**
- **TO WRITE CAUSE-EFFECT PARAGRAPHS**
- **TO PARAPHRASE AND SUMMARISE**
- **TO PROPERLY CITE AND LIST REFERENCES**
- **TO READ MATHEMATICAL FORMULAE**
- **TO HAVE ACQUIRED KNOWLEDGE AS TO HOW ENGLISH GRAMMAR IS USED IN ACADEMIC CONTEXT**

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?	
Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- SEARCH FOR ANALYSIS AND SYNTHESIS OF DATA AND INFORMATION WITH THE USE OF NECESSARY TECHNOLOGY
- WORKING INDEPENDENTLY
- PRODUCTION OF FREE, CREATIVE AND INDUCTIVE THINKING

SYLLABUS

English for Computer Science II	
Terminology	Network Topologies, The Internet Protocol, Networking Applications, Algorithms, Problem-solving, Heuristics, Flowcharts, Pseudocode, Programming Languages, the Machine Language, the Assembly Language, High-level Languages, Programming Paradigms, Software Engineering, the Software Life Cycle, The Development Phase, Development Process Models, Data structures, Arrays and Stacks, Relational Databases
Academic Grammar	Formal Language characteristics, Passive Voice, Verb Patterns, Phrasal and Prepositional Verbs
Academic Writing	Cause and Effect Paragraphs, Summarizing, Paraphrasing, References and Citations

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	• FACE-TO-FACE • DISTANCE LEARNING VIA THE MOODLE PLATFORM ON THE ECOURSE SERVICE OF THE UNIVERSITY OF IOANNINA
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• USE OF ITC IN TEACHING (VIDEOS, POWERPOINT PRESENTATIONS, EDUCATIONAL GAMES) • USE OF ICT IN COMMUNICATION WITH STUDENTS VIA THE MOODLE PLATFORM AND EMAIL
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.*	

Activity	*Semester workload*
Lectures	13*3 = 39 hours
Self-Study	26 hours

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		
	Course total	***65 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.*	LANGUAGE OF EVALUATION: ENGLISH EVALUATION METHOD: • 4 WRITTEN ASSIGNMENTS DURING THE SEMESTER (OPTIONAL) • WRITTEN EXAM (MULTIPLE CHOICE QUESTIONS, SHORT-ANSWERS, GAP FILLING, READING COMPREHENSION EXERCISES, WRITING) (COMPULSORY) EVALUATION CRITERIA: KNOWLEDGE OF THE TAUGHT TERMINOLOGY/ ACQUISITION OF BASIC SKILLS IN ACADEMIC WRITING/ACQUISITION OF ACADEMIC GRAMMAR DELIVERABLE: VIA THE ECOURSE SERVICE	

ATTACHED BIBLIOGRAPHY

Noni Rizopoulou. 2019. *Academic English for Computer Science*. Thessaloniki: Disigma Publications

Morley J., Doyle P. and I. Pople. 2007. University Writing Course. Berkshire: Express Publishing

MYY202. Calculus II

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY202**	**SEMESTER**	**2nd**
COURSE TITLE	Calculus II		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	5	6,5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=1536

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

After successfully completing this course, students will be able to:

- generate functions of many variables,
- understand and become familiar with function derivatives and partial derivatives,
- manage vectors and vector spaces,
- generate vector fields,
- calculate multiple integrals,
- utilize the basic theorems of vector calculus (Green's, Gauss' and Stokes' theorems).

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology

Project planning and management

Respect for difference and multiculturalism

Adapting to new situations *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Acquisition of basic knowledge in fundamental concepts of Infinite Calculus.
- Understand and become familiar with the derivative of functions of several variables and the concept of partial derivative.
- Flexibility to use methods for multiple integrals.
- Comfort and ability to handle problems in vector spaces and functions of many variables.
- Ease in studying, describing and solving problems in various areas of Computer Science and Engineering, such as Artificial Intelligence, Robotics, Optimization, Signal and Image Processing, Telecommunications, etc.
- Adapting to new situations, exercising critical skills, promoting free, creative and inductive thinking.

SYLLABUS

Geometry of Euclidean space (vectors, inner product of vectors, determinants, outer product of vectors, polar, cylindrical and spherical coordinates), Functions of many variables, Derivation of functions of many variables (limits and continuity, properties of the derivative, chain rule, slope and direction derivative, complex function theorem and inverse function theorem, higher order derivatives), Extrema of functions of several variables (Taylor's theorem, extrema of real functions, conditional extrema and Lagrange multipliers), Double and triple integrals (change of order of integration, change of variables theorem), Vector functions (curves and arc length, vector fields, divergence and swirl), Curvilinear and surface integrals (parametrized surfaces, surface area, surface integral of scalar function and vector field), Integral theorems of Vector Analysis (Green's theorem, Stokes' theorem, conservative vector fields, Gauss's divergence theorem).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In class
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	
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,*	

Activity	*Semester workload*
Lectures	13*5 = 65 hours
Self-study	85 hours

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*		
	Course total	***150 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.*	Written exam	

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Book [94645889]: ΔΙΑΝΥΣΜΑΤΙΚΟΣ ΛΟΓΙΣΜΟΣ, Jerrold E. Marsden, Anthony Tromba

Book [112700174]: Απειροστικός λογισμός: Συναρτήσεις πολλών μεταβλητών, Sullivan Michael,Miranda Kathleen (επιστ. επιμ. Μουστάνης Π,Παπαδόπουλος Π,Φατούρος Σ)

Book [77107082]: THOMAS ΑΠΕΙΡΟΣΤΙΚΟΣ ΛΟΓΙΣΜΟΣ, [George B. Thomas], Jr., Joel Hass, Christopher Heil, Maurice D. Weir

Book [94689203]: Λογισμός Συναρτήσεων Πολλών Μεταβλητών και Εισαγωγή στις Διαφορικές Εξισώσεις, 2η Έκδοση, Παπασχοινόπουλος Γ. - Σχοινάς Χ. - Μυλωνάς Ν.

Additional teaching materials:

Book [320085]: ΔΙΑΝΥΣΜΑΤΙΚΗ ΑΝΑΛΥΣΗ, ΓΙΑΝΝΟΥΛΗΣ ΙΩΑΝΝΗΣ

MYY203. Basic Circuit Theory

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY203**	**SEMESTER**	**2**
COURSE TITLE	Basic Circuit Theory		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**5(3,1,1)**	**6.5**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://www.cs.uoi.gr/~tsiatouhas/MYY203.htm

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course aims at introducing to students the fundamentals of circuit analysis.

After successfully passing this course the students will be able to:

- Apply the Kirchhoff's laws and the principle of energy conservation.
- Apply the node voltage and the mesh current methods to analyze RLC networks.
- Combine the Superposition as well as the Thevenin and Norton Theorems to simplify and analyze complex linear RLC circuits.
- Analyze simple non-linear networks using Kirchhoff's laws and the small signal method.
- Analyze circuits' operation in the frequency domain and work with passive filters.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma

Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Analysis of requirements for problem solving
- Abstraction ability for problem modeling
- Combination of existing info for the synthesis of new knowledge
- Working independently
- Team work

SYLLABUS

The circuit abstraction, Two-terminal elements, Signal representation, Resistive networks, Kirchhoff's laws, Circuit analysis, Dependent sources, RLC network theorems and analysis (Node Method, Mesh Current Method, Superposition, Thevenin's and Norton's Theorems), Two-port networks, Small signal analysis, Frequency response, Filters.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face, lectures, lab courses, home-works
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of e-slides and interactive board during lectures. • Circuit implementation and measurement at the laboratory (using signal generators, power supplies, multi-meters, oscilloscopes). • Course website maintenance. Announcements and posting of teaching material (lecture slides and notes). • Ecourse website maintenance. • Use of email for information exchange and improved communication with students.
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,*	

Activity	***Semester workload***
Lectures	13*4 = 52 hours
Laboratory practice	13*1 = 13 hours
Problems solving	10 hours
Study & bibliography	112.5 hours

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*	analysis	
	Course total	***187.5 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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final examination, which includes problem solving. The exam papers are evaluated based on the correctness and completeness of answers. (ii) Laboratory exercises on circuit implementation and measurement. The students are evaluated during their work at the laboratory. (iii) Home-works on problem solving. The home-works are marked based on their correctness and completeness. The evaluation procedure is accessible to students via the course website.	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [77112871]: Principles and Applications of Electrical Engineering, Rizzoni G., Kearns J., Εκδ.: McGraw-Hill, 2016.

Book [133035679]: Ανάλυση Ηλεκτρικών Κυκλωμάτων, 10η Έκδοση, Hayt William, Kemmerly Jack, Phillips Jamie, Durbin Steven, Κουτρούλης Ευτύχιος, Γυφτάκης Κωνσταντίνος (Επιστ. Επιμέλεια)

Book [133024442]: ΘΕΩΡΗΤΙΚΗ ΚΑΙ ΕΦΑΡΜΟΣΜΕΝΗ ΗΛΕΚΤΡΟΤΕΧΝΙΑ, ΠΑΠΑΪΩΑΝΝΟΥ Θ. ΑΓΓΕΛΟΣ

- Related academic journals:

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

MYY204. Discrete Mathematics I

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY204**	**SEMESTER**	**2**
COURSE TITLE	Discrete Mathematics I		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**5**	**6.5**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=777

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous. In contrast to real numbers that have the property of varying "smoothly", the objects studied in discrete mathematics – such as integers, graphs, and statements in logic – do not vary smoothly in this way, but have distinct, separated values. Discrete objects can often be enumerated by integers. More formally, Discrete Mathematics is the branch of Mathematics dealing with countable sets (sets that have the same cardinality as subsets of the natural numbers, including rational numbers but not real numbers).

Research in Discrete Mathematics increased in the latter half of the twentieth century partly due to the development of digital computers which operate in discrete steps and store data in discrete bits. Concepts and notations from Discrete Mathematics are useful in

studying and describing objects and problems in branches of computer science, such as computer algorithms, programming languages, cryptography, automated theorem proving, software development, databases and artificial intelligence.

This course, along with the course «MYY302: Discrete Mathematics II», jointly cover the topics of the computer scientist's perspective to Discrete Mathematics. After successfully passing this course, the students will be able to:

- To provide well-formed expressions of propositional logic representing properties.
- To understand the limitations of propositional logic in expressing more complex properties.
- To use the rules of inference to construct proofs in propositional logic.
- To explain with examples the basic terminology of functions, relations, and sets, perform the operations associated with sets, functions, and relations.
- To recognize equivalence / order relations and provide equivalence classes / extreme points and bounds.
- To identify and apply correctly basic proof techniques for checking the validity of an argument.
- To apply the principles of inclusion-exclusion and pigeonhole in practical examples.
- To use basic counting rules for solving more complex counting problems.
- To compute the (unconditional / conditional) probability of an event, or the expected value of a random variable.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	……

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Provision of rigorous and structured mathematical arguments
- Synthesis of diverse methods in problem solving
- Development of algorithmic thinking
- Abstraction capability in modeling real-life problems

SYLLABUS

Introduction to mathematical logic: Propositional logic, propositional calculus, formal proofs.

Proof Techniques: Contraposition, contradiction, mathematical induction.

Sets, relations, functions: Set operations and their properties, inclusion-exclusion principle, one-to-one / onto functions. Equivalence relations, order relations, extreme points and bounds. Asymptotic behavior of functions.

Countability: Finite / infinite sets, pigeonhole principle, Russell's paradox, Cantor's diagonalization method. **Counting:** Addition/multiplication rule, permutations and orderings, balls-into-bins, choice of unordered collections of with/without repetition. **Discrete probability:** Discrete sample space, event, conditional probability, Bayes rule, expected value of variable.

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Weekly lectures and tutorials, in class.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Transparencies, projector and interactive boards in lectures.
• Maintenance of course site with Calendar, Announcement, and provision of supplementary course material.
• Announcement of grades via the e-course platform of UOI.
• Use of email and social-media channels for direct communication with the students.</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>Weekly Lectures</td><td>13*4 = 52 hours</td></tr>
<tr><td>Weekly Tutorials</td><td>13*1 = 13 hours</td></tr>
<tr><td>Home Study</td><td>122,5 hours</td></tr>
<tr><td></td><td></td></tr>
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<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>187,5 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>ASSESSMENT LANGUAGE: Greek

ASSESSMENT METHODOLOGY:
(i) Final written examination

(ii) Two intermediate tests during the semester, for checking progress.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Discrete Mathematics and their Applications, 8th edition, Kenneth H. Rosen.
- Discrete Mathematics with Applications, Sussana S. Epp.
- Discrete Mathematics, ΑΘΑΝΑΣΙΑΔΗΣ Γ. ΑΝΔΡΕΑΣ
- Διακριτά Μαθηματικά και Θεωρία Αριθμών με Εφαρμογές, Ρασσιάς Μιχαήλ

- 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.

MYY205. Object Oriented Programming Techniques

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY205**	**SEMESTER**	**2**
COURSE TITLE	Object Oriented Programming Techniques		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**6(4,2,0)**	**7**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=399

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course aims at introducing the students to the Object Oriented Programming paradigm. This involves understanding the concepts of object oriented programming, and hands-on experience with an Object Oriented programming language such as Java.

After successfully passing this course the students will be able to:

- Understand the basic concepts of Object Oriented Programming such as classes, objects, data encapsulation, and inheritance.
- Understand more advanced concepts of Object Oriented programming such as polymorphism, late binding, abstract and generic classes, and event-driven programming.
- Design object oriented programs for simple tasks; implement the in Java.
- Design complex object oriented programs that involve multiple classes and objects for complex tasks; implement them in Java.

- Use libraries of code in their programs, and build on existing code to generate new programs.
- Understand the concepts of Abstract Data Types, Generic Classes, and basic data structures, and to use them in practice.
- Program in the Java Programming Language.
- Easily adapt their programming skills in Java to any other object oriented programming language.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Analysis of requirements for problem solving
- Algorithmic thinking
- Abstraction ability for problem modeling
- Working independently
- Team work

SYLLABUS

Introduction to Programming Paradigms: Review of the evolution of programming paradigms and the emergence of object oriented programming

Introduction to Java Programming: Java Virtual Machine, compiling, basic Java program syntax, control flow, arrays.

Classes and Objects: Introduction to the concept of classes and objects, definition of classes and objects in Java. Fields, methods, constructors. Encapsulation and Data hiding.

References: References to objects, program memory stack and heap. Parameter passing, and use of objects as method parameters. Copy constructors, deep and shallow copies. The reference this.

Class Composition: Creating complex programs with class composition. Objects as class fields, method parameters and return values.

Class Inheritance: Inheritance, polymorphism, late binding, abstract classes, interfaces, generic classes.

Data Structures: Collections and their use: Lists, Sets, Maps.

Exceptions: Dealing with program errors through exceptions.

Files: Reading from and writing to text files

Specialized topics: Graphical User Interfaces. Event-driven programming.

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Lectures, lab courses</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Use of projector and board during lectures.
• Use of computer for demonstration of programming.
• Use of computers in laboratories for development and testing of programs.
• Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs).
• Announcement of assessment marks via the ecourse platform by UOI.
• Use of email direct communication with students.</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>13*4 = 52 hours</td></tr>
<tr><td>Labs</td><td>10*2 = 20 hours</td></tr>
<tr><td>Self-study</td><td>115,5 hours</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>187,5 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>LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION
(i) Final examination, which includes questions for testing understanding and skills in developing and testing object oriented programs. The exam papers are evaluated based on the correctness and completeness of answers as well as comprehension of the material.
(ii) Laboratory exercises of program development and testing. The students are evaluated based on whether they managed to write and test correctly the requested programs within the given time.
(iii) Take-home programming assignments. The assignments are marked based on their correctness and completeness.

The evaluation procedure is accessible to students via the course website.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Book[59380297]: Absolute Java (contains CD), Savitch Walter.

Book [13549]: JAVA ΜΕ UML: ΑΝΤΙΚΕΙΜΕΝΟΣΤΡΕΦΗΣ ΣΧΕΔΙΑΣΗ ΚΑΙ ΠΡΟΓΡΑΜΜΑΤΙΣΜΟΣ, ELSE LERVIK, VEGARD B. HAVDAL.

Book [13596]: ΑΝΑΠΤΥΞΗ ΠΡΟΓΡΑΜΜΑΤΩΝ ΣΕ JAVA: ΑΦΑΙΡΕΣΕΙΣ, ΠΡΟΔΙΑΓΡΑΦΕΣ, ΚΑΙ ΑΝΤΙΚΕΙΜΕΝΟΣΤΡΕΦΗΣ ΣΧΕΔΙΑΣΜΟΣ, BARBARA LISKOV, JOHN GUTTAG

- *Related academic journals:*

- Science of Computer Programming, ELSEVIER.
- ACM Transactions on Programming Languages and Systems (TOPLAS).

MYY301. Software Development

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY301**	**SEMESTER**	**3**
COURSE TITLE	Software Development		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures / Labs / Tutorials	**5**	**6**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	special background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://www.cs.uoi.gr/~pvassil/courses/sw_dev/index.html		

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The goal of the course is twofold: one the one hand, the first goal is to present fundamental topics of design and development of software systems and on the other hand, a second goal concerns the hands-on experience of students with the design and implementation of a reasonably-sized software application structured in stages: requirement analysis, design construction and testing

After successfully passing this course the students will be able to:

- Understand the design of a documented object-oriented software system
- Recognize design flaws or virtues in an existing implemented object-oriented system
- Develop (i.e., design, implement, test) with adequacy and effectiveness an object-oriented software system

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	……

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Team work
- Algorithmic thinking
- Abstraction ability for problem modeling
- Design, implementation and testing of complex software projects

SYLLABUS

Revision of fundamental object oriented concepts.

Modeling techniques for object oriented software. UML modeling, Unified Process, Agile Modeling, UML Diagrams (class diagrams, sequence diagrams)

Methods for requirements engineering, analysis and design in the object oriented paradigm. Requirements analysis. Use cases.

Fundamental design principles and design metrics. Design Principles. Encapsulation. Demeter's Law. Single Responsibility Principle, Open-Closed Principle, Liskov Substitution Principle, Interface Segregation Principle, Dependency Inversion Principle. Cohesion Metrics.

Introduction to software testing and maintenance. Different kinds of testing. Testing techniques. Unit Testing. Junit.

Implementation of a sizeable software project in phases.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, lab courses
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector and interactive board during lectures. • Use of computer for demonstation of programming. • Use of computers in laboratories for development and testing of programs. • Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs). • Announcement of assessment marks via the

	course website • Use of email and social media for information exchange and improved communication with students.
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*	

Activity	*Semester workload*
Lectures	13*3 = 39 hours
Labs	13*2 = 26 hours
Self-study	85 hours
Course total	***150 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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final examination, which includes questions of program development and testing. The exam papers are evaluated based on the correctness and completeness of answers. (ii) Project developed by the students on their own that has a significant level of complexity and volume in terms of programming The final score is a weighted sum of the final exam (70%), project (30%) and a possible bonus of 10% for the best project. The evaluation procedure is accessible to students via the course website.

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Book [13600]: Αντικειμενοστρεφής Σχεδίαση: UML, Αρχές, Πρότυπα Και Ευρετικοί Κανόνες, Α. Χατζηγεωργίου, Κλειδάριθμος, ISBN 960-209-882-1.

Book [13596]: Ανάπτυξη Προγραμμάτων σε Java: αφαιρέσεις, προδιαγραφές, και αντικειμενοστρεφής σχεδιασμός, B. Liskov and J. Guttag, Κλειδάριθμος, ISBN 978-960-461-063-1.

- *Related academic journals:*

- IEEE Transactions on Software Engineering
- ACM Transactions on Software Engineering and Methodology

MYY302. Discrete Mathematics II

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES			
COURSE CODE	**MYY302**	**SEMESTER**	**3**
COURSE TITLE	Discrete Mathematics II		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**5**	**6**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://www.cs.uoi.gr/~cnomikos/courses/dm-ii/dm-ii-main.htm

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous. In contrast to real numbers that have the property of varying "smoothly", the objects studied in discrete mathematics – such as integers, graphs, and statements in logic – do not vary smoothly in this way, but have distinct, separated values. Discrete objects can often be enumerated by integers. More formally, Discrete Mathematics is the branch of Mathematics dealing with countable sets (sets that have the same cardinality as subsets of the natural numbers, including rational numbers but not real numbers).

Research in Discrete Mathematics increased in the latter half of the twentieth century partly due to the development of digital computers which operate in discrete steps and store data in discrete bits. Concepts and notations from Discrete Mathematics are useful in studying and describing objects and problems in branches of computer science, such as

computer algorithms, programming languages, cryptography, automated theorem proving, software development, databases and artificial intelligence.

This course, along with the course «MYY204: Discrete Mathematics I», cover the topics of the computer scientist's perspective to Discrete Mathematics. After successfully passing this course, the students will be able to:

- Convert logical statements from informal language to predicate logic expressions.
- Apply formal methods of logic, such as calculating validity of formulae and computing normal forms.
- Provide, and prove their correctness of, recurrence relations that describe sequences, or recursively defined structures.
- Apply techniques (e.g., characteristic polynomial, master theorem, generating functions, etc.) for solving linear recurrence relations.
- Use generating functions for modeling and solving counting problems.
- Perform elementary calculations in modulus arithmetic.
- Apply the Chinese Remainder Theorem for solving systems of linear congruences.
- Recognize and prove elementary properties (e.g., morphismms, hamiltonicity, Euler tours and trails, planarity, etc.) for certain graph families.
- Demonstrate different traversal methods for graphs and/or trees (BFS, DFS, PRE-, IN-, POST-ORDER).
- Model a variety of real-world problems in computer science using appropriate forms of graphs and trees, such as representing a network topology or the organization of a hierarchical file system.
- Determine whether a word belongs to a formal language that is generated by a given grammar.
- Understand the connection of finite-state machines and a certain type of grammars.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	……

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Provision of rigorous and structured mathematical arguments
- Synthesis of diverse methods in problem solving
- Development of algorithmic thinking
- Abstraction capability in modeling real-life problems

SYLLABUS

First-Order Predicate Logic: Semantics of predicate logic. Handling quantifiers. Check of validity of FOL formulae, using Tarski's truth.

Recurrence relations and recursively defined discrete structures: Sequences. Introduction to Sums. Methods for computing sums. Linear recurrence relations (homogeneous, non-homogeneous). The method of the characteristic equation. Divide-and-conquer algorithms and recurrence relations. Use of Master Theorem for analyzing the complexity of a recursive algorithm.

Generating functions: Ordinary and exponential GFs. Generalized binomial theorem. Use of GFs for solving recurrence relations and for proving identities. Application of GFs in counting.

Elements of Number Theory: Divisibility of integers. Prime numbers. Sieve of Eratosthenes. b-ary representations of natural numbers. Divisibility and primality criteria. Greatest common divisor and least common multiple. Algorithms for integer operations. Euclidean algorithm. Systems of linear congruences. The chinese remainder theorem. Arithmetic of large numbers. Public-key cryptography. The RSA cryptosystem.

Graph Theory: Degree, subgraph, handshaking lemma, graph classes, morphisms. Representations of graphs. Cut sets and separators, vertex/edge connectivity, blocks of graphs, Menger's theorem. Trees, characterizations and properties, enumeration, special classes of trees (m-ary trees), orderings. BFS/DFS traversals of graphs, minimum-cost spanning trees. Distances in graphs, shortest paths, detection of negative cycles. Euler circuits and trails. Hamilton cycles and paths. Planarity, Euler's formula, Kuratowski's theorem.

Grammars and finite-state automata: Recognition of language by a grammar or an automaton, simplification of an automaton, deterministic/nondeterministic automata and their equivalence.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Weekly lectures and tutorials, in class.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Transparencies, projector and interactive boards in lectures. • Maintenance of course site with Calendar, Announcement, and provision of supplementary course material. • Announcement of grades via the e-course platform of UOI. • Use of email and social-media channels for direct communication with the students.
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.*	

Activity	*Semester workload*
Weekly Lectures	13*4 = 52 hours
Weekly Tutorials	13*1 = 13 hours
Home Study	85 hours

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		
	Course total	***150 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.*	ASSESSMENT LANGUAGE: Greek ASSESSMENT METHODOLOGY: (i) Final written examination (ii) Two intermediate tests during the semester, for checking progress.	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Discrete Mathematics and their Applications, 8th edition, Kenneth H. Rosen.
- Discrete Mathematics with Applications, Sussana S. Epp.
- Concrete Mathematics: A Foundation for Computer Science, Ronald L. Graham, Donald E. Knuth, Oren Patashnik.
- Θεωρία Αριθμών, Παναγιώτης Γ. Τσαγκάρης.
- Μια Εισαγωγή στη Θεωρία Αριθμών, Δημήτρης Δεριζιώτης.
- Συνκριτά Μαθηματικά: Μια Θεμελίωση για την Επιστήμη των Υπολογιστών, Ronald L. Graham, Donald E. Knuth, Oren Patashnik.
- Διακριτά μαθηματικά, Hunter David (Συγγρ.) - Φωτάκης Δημήτρης, Κοντογιάννης Σπύρος (Επιμ.)

- 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.

MYY303. Data Structures

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**MYY303**	**SEMESTER**	**3**	
COURSE TITLE	Data Structures			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures / Labs / Tutorials		**6**	**6**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background			
PREREQUISITE COURSES:	-			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=704			

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course studies fundamental data structures that are widely used in a variety of applications. The course emphasizes both the basic techniques for the design and analysis of data structures and the implementation of efficient programs.

Students who complete the course successfully learn to:

- Analyze the performance of fundamental data structures.
- Estimate the running time of the various operations a data structure performs.
- Compare the efficiency and suitability of different data structures for solving specific problems.
- Design compound data structures or data structures adapted to a specific problem.
- Apply basic techniques for the design of algorithms, such as recursion and “divide and conquer”.

- Implement efficient algorithms and data structures for solving various problems.
- Use abstract data types to develop libraries of basic data structures.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking.
- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Use of mathematical thinking to develop and sustain arguments.
- Algorithmic thinking for problem solving.
- Abstraction ability for problem modeling.
- Working independently.
- Team work.

SYLLABUS

Basic concepts: Algorithms, abstract data types.

Arrays, lists and recursion: Arrays. Linked lists, single, double and circular list, list processing. Memory allocation, compound data structures, multidimensional arrays. Recursion, linear recursion, binary and multiple recursion. Array and list processing with recursion.

Graphs and trees: Definition and representation of a graph, adjacency matrix, adjacency lists. Graph traversal, breadth-first search, depth-first search. Trees, tree representations. Binary trees, mathematical properties of binary trees. Tree traversal. Recursive tree algorithms.

Analysis of algorithms: Theoretical and empirical analysis of algorithms. Growth rates of functions. Asymptotic notation, invariants, induction. Recurrence relations.

Collections, stacks and queues: Collections of items. Pushdown stack. FIFO queue. Generalized queues.

Priority queues: Elementary implementations. Binary heap. Priority queues and sorting, heapsort. d-heap. Applications.

Dictionaries and search trees: Ordered and unordered dictionaries. Elementary implementations. Binary search trees. Randomly built binary search trees.

Balanced search trees: Randomized trees, splay trees, AVL trees, (a,b) trees, red-black trees, skip lists.

Hashing: Hash functions. Collisions, separate chaining, open addressing. Universal hash functions. Perfect hashing.

String processing: Tries and compact tries. Suffix trees and suffix arrays.

Disjoint set union: Linked list representation. Array representation. Fast find and fast unite data structures. Weighted union. Path compression.

Memory management: Memory hierarchy (cache, main, and external memory). Memory allocation in Java. B-trees, extendible hashing.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Weekly lectures and weekly lab courses.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector and interactive board during lectures. • Use of computers in laboratories for development and testing of programs. • Use of the eCourse platform by UOI for posting weekly calendar, announcements, homework assignments, lab exercises, teaching material (lecture slides and notes), and grades. • Use of email for information exchange and improved communication with students.
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*	

Activity	*Semester workload*
Lectures	13*4 = 52 hours
Labs	7*2 = 14 hours
Self-study	84 hours
Course total	***150 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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (a) Homework assignments (problem sets). (b) Weekly laboratory exercises. (c) Final written examination.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [32997672]: Data Structures & Algorithms in JAVA, Michael T. Goodrich, Roberto Tamassia.

Book [112692984]: Δομές Δεδομένων, 3η Έκδοση, Μποζάνης Παναγιώτης Δ

Book [260]: Data Structures, George F. Georgakopoulos.

Book [23101]: Εισαγωγή στις δομές δεδομένων και στους αλγόριθμους, Παπουτσής Ιωάννης

Book [133029840]: Δομές Δεδομένων και Ανάλυση Αλγορίθμων με Java, Weiss Mark Allen

Πρόσθετο Διδακτικό Υλικό:

Βιβλίο [59303644]: ΔΟΜΕΣ ΔΕΔΟΜΕΝΩΝ, Λουκάς Γεωργιάδης

- Related academic journals:

- SIAM Journal on Computing (SICOMP), SIAM.
- ACM Transactions on Algorithms (TALG), ACM.
- Algorithmica, Springer.

MYY304. Probability and Statistics

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**MYY304**	**SEMESTER**	**3**	
COURSE TITLE	Probability and Statistics			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials			**5**	**6**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background			
PREREQUISITE COURSES:	-			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	http://www.cs.uoi.gr/~kblekas/courses/probstat/			

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course aims to expose the students to modelling and analysis of random phenomena. Basic notions of probability and statistics as well as methods of modelling basic probabilistic and stochastic phenomena are introduced. At the end of this course, students will be able to model simple probabilistic and stochastic phenomena mathematically and will be able to calculate probabilities of events in a known event space, expected values and variances of random variables.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

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
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues

Team work *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

It is expected that the student after taking the course will be able to:

- define the basic concepts of probability theory and statistics
- solve simple probabilistic problems
- communicate oral and written probabilistic reasoning
- have basic skill to use mathematics and computer programs as tools for probability and statistical analysis

SYLLABUS

Fundamentals of probability: Definition of sample space, axiomatic and relative frequency definitions of probability, Probability theorems, compound and conditional probability, independence of events, Bayes theorem.
Random variables, probability density and distribution functions, expected value and variance, known distributions of discrete and continuous random variables, moments, moment generation function, characteristic function.
Multivariate random variables, marginal distributions, conditional distributions, correlation, correlation coefficient, functions of one and many random variables, Laws of large numbers, Central limit theorem.
Statistics: Descriptive Statistics, Inferential statistics, Confidence Intervals, Hypothesis Testing.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector during lectures. • Use of computer for demos • Course website maintenance: announcements, assignments and posting of teaching material (lecture slides, notes, work papers, demos, etc.). • Use of email for information exchange and improved communication with students.
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*	

Activity	***Semester workload***
Lectures	13*4 = 52 hours
Tutorials	13*1 = 13 hours
Self-study	85 hours
Course total	***150 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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final examination (60%) (ii) Two midterm exams (40%). (ii) Take-home assignments (optional). The assignments are marked based on their correctness and completeness. The evaluation procedure is accessible to students via the course website.

ATTACHED BIBLIOGRAPHY

Book [112691973]: Πιθανότητες και Στατιστική για Μηχανικούς, Μυλωνάς Νίκος - Παπαδόπουλος Βασίλειος

Book [86198781]: Θεωρία πιθανοτήτων &στοιχεία στατιστικής ανάλυσης, Φιλιππάκης Μ.

Book [33114257]: Εισαγωγή στις πιθανότητες με στοιχεία στατιστικής, Μπερτσεκάς Δ. - Τσιτσικλής Γ.

Book [35478]: Εισαγωγή στις Πιθανότητες και τη Στατιστική, Δαμιανού Χ., Χαραλαμπίδης Χ., Παπαδάτος Ν.

Book [112702629]: ΠΙΘΑΝΟΤΗΤΕΣ ΚΑΙ ΣΤΑΤΙΣΤΙΚΗ ΓΙΑ ΜΗΧΑΝΙΚΟΥΣ, ΖΙΟΥΤΑΣ ΓΕΩΡΓΙΟΣ

Book [59397306]: Εφαρμοσμένη Στατιστική και Πιθανότητες για Μηχανικούς, 6η Έκδοση, Montgomery Douglas- Runger C. George

MYY305. Digital Design I

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY305**	**SEMESTER**	**3**
COURSE TITLE	Digital Design I		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**6**	**6**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	special background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://www.cs.uoi.gr/~kabousia/DigitalDesignIGR.htm

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course aims to expose the students to designing basic digital combinational and sequential circuits. Basic notions of Circuit Modeling using simple logic gates and hardware description languages are introduced. At the end of this course, students will be able to model logic circuits using Boolean Algebra, analyze, simplify and design combinational and sequential logic circuits, design and use complex modules (adders, decoders, multiplexers) for designing combinational circuits, design multi-functional registers and simple RAMs. The student will also be able to model simple digital circuits using Hardware Description Language (Verilog) and simulate circuit behavior using waveforms.

Students elaborate on the basic theory through laboratory exercises.

After taking this course students will be able to:

- Apply Boolean Algebra to simplify Boolean expressions.
- Design combinational logic circuits built from standard logic gates.
- Understand and use binary codes.
- Combine elementary logic units to create advanced digital circuits.
- Design digital circuits using decoders and multiplexers
- Understand and use memory elements.
- Design sequential logic using standard logic gates and memory elements.
- Design multi-functional registers using memory elements

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Analysis of requirements for problem solving
- Team work

SYLLABUS

Theory

Digital abstraction, Voltage levels, Static discipline, Digital gates, Binary coding, Boolean algebra (axioms, theorems, standard forms), Boolean functions, Boolean function simplification, Karnaugh maps (two, three, four and five variables).
Combinational Circuit Design. Digital Implementation using combinational gates, adders, Multiplexers, Demultiplexers, Encoders, Decoders. ROM and combinational circuits.
Design of latches and Flip-Flops. Sequential Circuit Design.
Binary Counters-Registers.

Laboratory

Design of combinational circuits using primitive gates.
Design of combinational circuits using multiplexers and decoders.
Design of sequential circuits and finite state machines.
Design of registers and static memories.

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Lectures, lab courses</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Use of projector and interactive board during lectures.
• Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs).
• Announcement of assessment marks via the ecourse platform by UOI.
• Use of email and social media for information exchange and improved communication with students.</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>13*3 = 39 hours</td></tr>
<tr><td>Tutorials</td><td>13*1 = 13 hours</td></tr>
<tr><td>Labs</td><td>10*2 = 20 hours</td></tr>
<tr><td>Self-study</td><td>78 hours</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></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>LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION
(i) Final examination, which includes problem solving. The exam papers are evaluated based on the correctness and completeness of answers.
(ii) Laboratory Examination</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [112706646]: Σχεδίαση Ψηφιακών Συστημάτων με τη Γλώσσα VHDL, 3η Βελτιωμένη Έκδοση, Brown, Vranesic, Μιχαήλ Γ. Δημόπουλος (Επιστ. επιμέλεια)

Book [68406394]: Ψηφιακή Σχεδίαση, Morris Mano, Michael Ciletti

-Συναφή επιστημονικά περιοδικά:

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

MYY401. Principles of Programming Languages

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY401**	**SEMESTER**	**4**
COURSE TITLE	Principles of Programming Languages		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures/Laboratory/Tutorials	**3/2/0**	**6**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General Background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://www.cs.uoi.gr/~cnomikos/courses/pl/pl-main.htm

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course objective is to present the main concepts in the design and implementation of programming languages and to examine and compare the various categories of programming languages as well as their characteristics.

A student that successfully attends the course will be able to:

- learn easily new programming languages
- select the most appropriate language for an application
- make a better use of the characteristics of a programming language
- describe formally the syntax of a programming language
- write small programs in the functional language Haskell
- write small programs in the logic programming language Prolog.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Adapting to new situations
- Working independently
- Production of free, creative and inductive thinking
- Decision-making

SYLLABUS

Classification of programming languages. Implementation methods: compilation, interpretation and hybrid methods. Syntax and semantics. BNF and syntactic diagrams.

Imperative languages. Constants, variables and expressions. Expression evaluation. Assignment, selection and iteration commands. Binding, lifetime and scope. Memory management. Subprograms and parameter passing. Data types. Type implementation. Type equivalence.

Functional programming. The Haskell programming language. Recursive functions. Lazy evaluation. Higher order functions. Polymorphism.

Logic programming. The Prolog programming language. Predicates, terms, facts, rules and queries. Recursive predicates. Unification and goal satisfaction algorithms. Cut and negation as failure.

Object-oriented languages: objects, classes, encapsulation, inheritance.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, Labs
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector and interactive board during lectures. • Maintenance of a course website, in which announcements, lab exercises, lecture notes, solution to exercises and other useful material is posted. • Use of email for communication with students. • Announcement of assessment marks via the ecourse platform by UOI. • Use of computers in laboratories for writing programs in Haskell and Prolog programming

<table>
<tr><td></td><td>languages.</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>13x3 = 39 hours</td></tr>
<tr><td>Laboratory</td><td>13x2 = 26 hours</td></tr>
<tr><td>Self-study</td><td>85 hours</td></tr>
<tr><td></td><td></td></tr>
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<tr><td></td><td></td></tr>
<tr><td></td><td></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>LANGUAGE OF EVALUATION: Greek

METHOD OF EVALUATION:
(i) Final written examination
(ii) Laboratory exercises

The evaluation procedure is accessible to students via the course website.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

ΣΥΓΧΡΟΝΕΣ ΓΛΩΣΣΕΣ ΠΡΟΓΡΑΜΜΑΤΙΣΜΟΥ, BROOKS WEBBER ADAM
"Programming Language Pragmatics", Michael Scott
Concepts of Programming Languages, 11th Edition, Robert W. Sebesta

- *Related academic journals:*

- ACM Transactions on Programming Languages and Systems (TOPLAS)
- Journal of Functional Programming (Cambridge University Press)
- Journal of Logical and Algebraic Methods in Programming (Elsevier)

MYY403. Introduction to Numerical Analysis

COURSE OUTLINE

GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY403**	**SEMESTER**	**4**
COURSE TITLE	Introduction to Numerical Analysis		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**4/1/1**	**6**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=1759

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Numerical Analysis is the branch of applied mathematics that develops, analyzes and implements algorithms to find approximate solutions to continuous problems. Key issues are computations and errors, finding approximate solutions of linear systems and nonlinear equations, interpolation and extrapolation, as well as numerical differentiation and integration. Particular emphasis is given to the understanding and utilization of the basic algorithms and their applicability issues.

After successful participation in the course, the students are expected to:

- Understand state-of-the-art numerical methods for the numerical solution of linear systems and nonlinear equations, for interpolation and extrapolation, as well as for numerical differentiation and integration.
- Be aware of the application requirements, the advantages and disadvantages of the algorithms.

- Implement on the computer and apply the aforementioned methods.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

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* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Production of free, creative and inductive thinking.
- Consolidation, deepening and application of mathematical knowledge.
- Familiarity with state-of-the-art numerical methods.
- Familiarity with the implementation of basic numerical methods.

SYLLABUS

- Computation and error
- Numerical solution of linear systems
- Finite and divided differences
- Numerical solution of nonlinear equations
- Interpolation and extrapolation
- Numerical differentiation and integration

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, lab courses
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Course webpage where literature and freely available educational material is provided. • Live simulations in the classroom. • Use of the asynchronous tele-education services of University of Ioannina. • Use of email services and social media for communication with the students.
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-*	

Activity	*Semester workload*
Lectures	13*5 = 65 hours
Self-study	85 hours

directed study according to the principles of the ECTS	***Course total*** | ***150 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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION: Final written exams.

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Book [59366700]: Εισαγωγή στην Αριθμητική Ανάλυση. Γ. Δ. Ακρίβης, Β. Α. Δουγαλής. Πανεπιστημιακές Εκδόσεις Κρήτης, Ηράκλειο, 2015.

Book [12867995]: Αριθμητική Ανάλυση: Εισαγωγή. Μ. Ν. Βραχάτης. Εκδόσεις Κλειδάριθμος, Αθήνα, 2011.

Book [122075205]: Εισαγωγή στην αριθμητική ανάλυση, Βασίλειος Κοκκίνης, Ιωάννης Κολέτσος

MYY404. Electronics

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**MYY404**	**SEMESTER**	**4**	
COURSE TITLE	Electronics			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures / Labs / Tutorials		**6 (3,2,1)**	**6**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background			
PREREQUISITE COURSES:	-			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	http://www.cse.uoi.gr/~tsiatouhas/MYY404-ELEC.htm			

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course aims at introducing to students the fundamentals of electronic circuit analysis, synthesis, design, simulation, implementation and measurement.

After successfully passing this course the students will be able to:

- Understand electronic devices (diodes, transistors)
- Analyze simple or complex electronic circuits
- Synthesize electronic circuits
- Design and simulate electronic circuits
- Implement electronic circuits and measure their characteristics
- Verify the correct operation of a given circuit

General Competences	
Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?	
Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….
• Production of free, creative and inductive thinking • Search for, analysis and synthesis of data and information, with the use of the necessary technology • Adapting to new situations • Analysis of requirements for problem solving • Abstraction ability for problem modeling • Combination of existing info for the synthesis of new knowledge • Working independently • Team work	

SYLLABUS

Introduction on circuit theory. Amplifiers - Operational amplifiers. Semiconductors theory. The p-n junction - Diodes. Diode circuits (rectifier and limiting circuits). Field effect transistors and bipolar junction transistors: a) physical structure and operation, b) current-voltage characteristics, c) DC operation - bias, d) small-signal equivalent circuit models. Single-stage transistor based amplifier topologies: biasing and operation. Differential amplifiers. Multi-stage amplifiers. Frequency response. Feedback.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face, lectures, lab courses, home-works
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of e-slides and interactive board during lectures. • Use of computer-aided design tools at the laboratory (circuit design and simulation). • Use of components and instruments (signal generators, power supplies, multi-meters, oscilloscopes) at the laboratory for circuit implementation and measurement. • Course website maintenance. Announcements and posting of teaching material (lecture slides and notes). • Ecourse website maintenance. • Use of email for information exchange and

<table>
<tr><td></td><td>improved communication with students.</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>13*3 = 39 hours</td></tr>
<tr><td>Laboratory practice</td><td>11*2 = 22 hours</td></tr>
<tr><td>Tutorials</td><td>13 hours</td></tr>
<tr><td>Problems solving</td><td>10 hours</td></tr>
<tr><td>Study & bibliography analysis</td><td>66 hours</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></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>LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION
(i) Final examination, which includes problems solving. The exam papers are evaluated based on the correctness and completeness of answers (80%).
(ii) Laboratory exercises on circuit design and simulation as well as on circuit implementation and measurements. The students are evaluated during their work at the laboratory and with final examination at the laboratory (20%).
(iii) Home-works on problem solving. The home-works are marked based on their correctness and completeness (bonus up to 10% in case of successful evaluation in i & ii).
The evaluation procedure is accessible to students via the course website.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [68380792]: MICROELECTRONICS, Richard Jaeger and Travis Blalock, 5th edition, McGraw-Hill, 2018.

Book [**77108680**]: FUNDAMENTALS OF MICROELECTRONICS, 2nd edition, John Wiley & Sons, BEHZAD RAZAVI, 2018.

- Related academic journals:

- Transactions on Circuits and Systems I & II (TCAS), IEEE.
- Journal of Solid-State Circuits (JSSC), IEEE.

MYY405. Design and Analysis of Algorithms

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY405**	**SEMESTER**	**4**
COURSE TITLE	Design and Analysis of Algorithms		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**6**	**6**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://www.cs.uoi.gr/~stavros/mypage-teaching-BSc-DAA.html

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course is intended: (i) to teach design techniques and algorithms for solving real-life problems that arise frequently in computer applications; (ii) to teach principles and techniques of computational complexity (worst-case and average-case behavior, space usage, and lower bounds on the complexity of a problem); (iii) to introduce the areas of NP-completeness and parallel algorithms.

The course's aims are to develop skills on efficient algorithm design and to critically respond on issues regarding the efficiency of a new algorithm answering questions such as: Is the new algorithm efficient? Is there a better design and/or implementation? Moreover, the students are expected to be able to always answering questions such as:

- How can this be done efficiently?
- What data structure would be useful here?

- Which operations should we focus on analyzing this algorithm?

On completion of this course, students will be able to analyze algorithms and prove their correctness and also they will be aware of how an algorithm actually behaves on various inputs.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Algorithmic thinking
- Abstraction ability for problem modeling
- Working independently
- Team work

(1) SYLLABUS

Techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice.

Topics: growth of functions; recurrence; sorting; median and other statistics; divide-and-conquer; dynamic programming; amortized analysis; graph algorithms; shortest paths; spanning trees; sorting networks; polynomial and matrix calculations; parallel algorithms; NP-completeness.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, exercises, lab sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector and interactive board during lectures. • Use of computers in laboratories for development and testing of programs. • Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs). • Announcement of assessment marks via the e-course platform by UOI.
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*	

Activity	***Semester workload***
Lectures	13*4 = 52 hours
Labs	12*2 = 24 hours
Self-study	74 hours

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*		
	Course total	***150 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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final examination. (ii) Laboratory exercises of program development and testing. The students are evaluated based on whether they managed to write and test correctly the requested programs within the given time. (iii) Take-home programming assignments. The assignments are marked based on their correctness and completeness. The evaluation procedure is accessible to students via the course website.	

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Book [59359780]: ΕΙΣΑΓΩΓΗ ΣΤΟΥΣ ΑΛΓΟΡΙΘΜΟΥΣ, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, ΙΤΕ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, 1η/2009

Book [13583]: ΑΛΓΟΡΙΘΜΟΙ, SANJOY DASGUPTA, CHRISTOS PAPADIMITRIOU, UMESH VAZIRANI, ΚΛΕΙΔΑΡΙΘΜΟΣ, 1η/2009

Book [13898]: ΣΧΕΔΙΑΣΜΟΣ ΑΛΓΟΡΙΘΜΩΝ, JON KLEINBERG, EVA TARDOS, ΚΛΕΙΔΑΡΙΘΜΟΣ, 1η/2009

Book [59367744]: Αλγόριθμοι, Edmonds Jeff, ΕΚΔΟΣΕΙΣ ΚΡΙΤΙΚΗ ΑΕ, 1η έκδ./2016

MYY406. Digital Design II

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**MYY406**	**SEMESTER**	**4**	
COURSE TITLE	Digital Design II			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures / Labs / Tutorials		**5**	**6**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background			
PREREQUISITE COURSES:	-			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=1534			

(1) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course aims to expose the students to the design process of Digital Circuits and Systems. Basic design processes using high-level behavioral descriptions with VHDL are introduced. The whole design process from design entry to synthesis into gate level description, partitioning, floorplaning, placement & routing is presented. The basic principles of programmable devices are also presented. At the end of this course, students will be able to describe systems using behavioral and structural modeling in high-level hardware description language, understand the basic steps of the system development and finally develop circuits using FPGAs.

After taking this course students will be able to:

- Design a circuit on a CAD tool using library gates and complex structures (decoders, multiplexers, adders etc).
- Design arithmetic circuits.
- Describe a circuit using VHDL.

- Simulate a circuit using CAD tools.
- Understand the back-end of the design process.
- Understand the basic principles of Programmable Devices.
- Program FPGAs

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	……
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Analysis of requirements for problem solving
- Team work

SYLLABUS

Theory

Design entry with CAD tools.
Elementary Digital-Arithmetic Circuits.
RTL Design.
Design of Digital Circuits with VHDL (Basic & Composite Data Types, Behavioral & Structural Modeling, Subroutines, Packages, Libraries, Simulation, Synthesizable units with VHDL).
Memories, Back-End (Partitioning, Floorplanning, Placement, Global & Detailed Routing).
Programmable Devices (PLAs, PLDs, CPLDs), Field Programmable Gate Arrays).
Input/Output.

Laboratory

Design of combinational and sequential units using primitive gates.
Design of combinational and sequential units using VHDL.
Hierarchical Design and Embedded Cores.
Advanced circuit design using embedded memory.
System programming using FPGAs

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, lab courses
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education,*	• Use of projector and interactive board during lectures. • Use of special electronic equipment and software

communication with students	at the laboratory. • Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs). • Announcement of assessment marks via the ecourse platform by UOI. • Use of email and social media for information exchange and improved communication with students.
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*	***Activity*** / ***Semester workload*** Lectures: 13*3 = 39 hours Labs: 13*2 = 26 hours Self-study: 60 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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final examination, which includes problem solving. The exam papers are evaluated based on the correctness and completeness of answers. (ii) Laboratory Examination The evaluation procedure is accessible to students via the course website.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [64314]: Ψηφιακή Σχεδίαση με VHDL, P. J. Ashenden (Εκδόσεις Νέων Τεχνολογιών)
Book [18548869]: ΨΗΦΙΑΚΑ ΣΥΣΤΗΜΑΤΑ, Μοντελοποίηση & Προσομοίωση με τη γλώσσα VHDL, Σ. Σουραβλάς, Μ. Ρουμελιώτης (Publisher: Tziolas).

-Συναφή επιστημονικά περιοδικά:

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

MYY501. Theory of Computation

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY501**	**SEMESTER**	**5**
COURSE TITLE	Theory of Computation		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials		**5/0/0**	**6**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://www.cse.uoi.gr/~palios/automata/		

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course aims at introducing the students to the fundamental concepts pertaining to computation, to the main models of computation, and to the undecidability.

After having successfully completed this course, the students will be able:

- To have a good understanding of the fundamental notions of the subject of Formal Languages and Models of Computation.
- To understand and design regular expressions.
- To understand the function of deterministic and non-deterministic finite automata and to construct such automata for recognizing languages.
- To construct deterministic automata equivalent to non-deterministic ones.
- To know the closure properties of regular languages and to use them in order to

prove that a language is regular.

- To know the Pumping Lemma for regular languages and to use it to prove that a language is not regular.
- To construct context-free grammars for context-free languages.
- To understand the function of pushdown automata and to construct such automata for recognizing languages.
- To transform context-free grammars into grammars in Chomsky normal form.
- To know the closure properties of context-free languages and to use them in order to prove that a language is context-free.
- To know the Pumping Lemma for context-free languages and to use it to prove that a language is not context-free.
- To understand the function of deterministic and non-deterministic Turing machines and to construct such machines for recognizing and deciding languages.
- To prove that a given language is recursive (i.e., a given problem is decidable).
- To know the relationships among the regular, context-free, recursive, and recursively enumerable languages.
- To know the P and NP classes of problems.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*

- Search for, analysis, and synthesis of data, methodologies, and information, with the use of the necessary technology
- Structured mathematical thinking
- Algorithmic thinking
- Promotion of free, creative, and inductive thinking
- Working independently

SYLLABUS

Regular languages: regular expressions, deterministic and non-deterministic finite automata, language recognition using a finite automaton, equivalence of deterministic and non-deterministic finite automata, construction of a finite automaton recognizing the language described by a regular expression, construction of a regular expression describing the language recognized by a finite automaton, closure properties, pumping lemma for regular languages and its use in proving that a language is not regular, algorithms for finite automata and regular expressions.

Context-free languages: context-free grammars, leftmost/rightmost derivation, derivation trees, ambiguous grammars, regular context-free grammars, pushdown automata, non-equivalence of deterministic and non-deterministic pushdown automata, equivalence of the

set of languages recognized by (non-deterministic) pushdown automata and the set of languages derived by context-free grammars, Chomsky normal form, closure properties, pumping lemma for context-free languages and its use in proving that a language is not context-free, algorithms for pushdown automata and context-free grammars.
Recursively enumerable and recursive languages: Turing machines, recognizing and deciding languages using a Turing machine, equivalence of deterministic and non-deterministic Turing machines, language enumeration, equivalence of different Turing machine models, closure properties, Church-Turing thesis.
Undecidability: Decidable problems for finite automata and regular expressions, a language that is not recursively enumerable, the halting problem, reductions, the Post correspondence problem.
Classes P and NP.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Weekly Lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of computer presentations during lectures. • Course website maintenance with announcements and posting of teaching material (lecture slides, solved exercises). • Announcement of grades via the online platform of UOI.
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*	
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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final examination (counts for the 80% of the final grade) that includes exercises and theory questions. (ii) Midterm (counts for the 20% of the final grade) that includes exercises on the first half of the course material, which aims at an intermediate evaluation of the students.

Activity	***Semester workload***
Lectures	13*3 = 39 hours
Exercise solution	13*2 = 26 hours
Self-study	85 hours
Course total	***150 hours***

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Book [11776]: Η. Lewis, Χ. Παπαδημητρίου, Στοιχεία Θεωρίας Υπολογισμού, Εκδόσεις Κριτική, 2005.

Book [86195794]: M. Sipser, Εισαγωγή στη Θεωρία Υπολογισμού, Πανεπιστημιακές Εκδόσεις Κρήτης, 2009.

- *Related academic journals:*

- Computational Complexity (Springer)
- SIAM Journal on Computing
- Journal of the ACM
- Journal of Computer and System Sciences (Elsevier)
- Theoretical Computer Science (Elsevier)
- Information and Computation (Elsevier)
- Theory of Computing Systems (Springer)
- Journal of Complexity (Elsevier)
- Bulletin of the EATCS
- Journal of Automata, Languages and Combinatorics (Otto-von-Guericke-Universität Magdeburg)

MYY502. Systems Programming

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**MYY502**	**SEMESTER**	**5**	
COURSE TITLE	Systems Programming			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures / Labs		**6**	**6**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background			
PREREQUISITE COURSES:	-			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	http://www.cse.uoi.gr/index.php?menu=m219&id=MYY502 http://www.cse.uoi.gr/~dimako/teaching/fall20.html			

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course consists of two parts: a) learning the C programming language and b) applying it to POSIX systems programming. C is one of the most popular languages (if not the most popular). It is suitable from general application development but is indispensable when it comes to system-level programming (e.g. operating systems, support libraries, compilers, embedded systems software, etc). UNIX/POSIX-style systems provide all the needed facilities through a well-organized API.

After successfully passing this course the students will be able to:

- Study and understand programs in C.
- Write programs in C, compile them and produce independent applications.
- Use compilers and more advanced development tools.
- Handle pointes and strings.

- Perform dynamic memory management wherever necessary.
- Program in the system level through basic POSIX calls.
- Store and retrieve data to/from secondary storage programmatically, through text and binary files.
- Create new processes at runtime.
- Select and apply the most appropriate interprocess communication mechanism.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*

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

SYLLABUS

Part A: The C programming language

- Basic C (basic data types, expressions, operators, control flow, functions)
- Arrays and strings
- Advanced elements (structs, unions, bitwise operators, variadic functions)
- Pointers
- Dynamic memory management
- Input/output and text files
- Preprocessor

Part B: POSIX systems programming using C

- Error handling
- Redirection
- Binary files
- Processes
- Interprocess communication (unnamed and named pipes, message queues, shared memory)
- Advanced topics (security, assembly language, development tools for large projects)

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face class lectures, laboratory practice</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Use of projector electronic slides.
• Use of computers during the Lab practice.
• Course website maintenance with announcements and posting of teaching material (lecture slides and notes).
• Announcement of assessment marks via the ecourse platform by UOI.
• Use of email for communicating with students.</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>13*4 = 52 hours</td></tr>
<tr><td>Labs</td><td>13*2 = 26 hours</td></tr>
<tr><td>Self-study</td><td>84,5 hours</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>162,5 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>LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION
(i) Two in-Lab midterms, which require the development of programs on a computer.
(ii) Final examination, in two parts: a) multiple-choice questions and b) program development on a computer.

Lab midterms count for 40% and the final exam counts for 60% in the course grade.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Γ. Σ. Τσελίκης - Ν. Δ. Τσελίκας, *C: Από τη Θεωρία στην Εφαρμογή*, Εκδόσεις Τσελίκης
- Marc J. Rochkind, *Προγραμματισμός σε UNIX*, Εκδόσεις Κλειδάριθμος, 2007
- Brian W. Kernighan, Dennis M. Ritchie, *Η γλώσσα προγραμματισμού C*, Εκδόσεις Κλειδάριθμος, 2008
- Eric S. Roberts, *Η τέχνη και η επιστήμη της C: Μία εισαγωγή στην επιστήμη των υπολογιστών*, Εκδόσεις Κλειδάριθμος, 2004
- G. Graham, A. King, *Unix για προγραμματιστές και χρήστες*, Εκδόσεις Μ. Γκιούρδα, 2005
-

- Related academic journals:

- Software, IEEE.
- Software: Practice and Experience, Wiley.
- Science of Computer Programming, Elsevier.
- Journal of Systems and Software, Elsevier.

MYY503. Signals and Systems

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY503**	**SEMESTER**	**5**
COURSE TITLE	Signals and Systems		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures / Labs / Tutorials	**6**	**6**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://cs.uoi.gr/~cnikou/Signals_and_Systems.html		

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course aims to introduce the students to linear, time invariant systems in the time and frequency domains. Both continuous and discrete time signals and systems are studied. The fundamental property of the output of systems having as input a complex exponential is thoroughly investigated. At the end of the course, the student will be able to compute the output of a system both in the temporal and frequency domains and solve linear differential (difference) equations, describing a system in the Fourier (Z) domain.

It is expected that the student after attending the course will be able to:

- understand the fundamental notions of linearity and time invariance and their importance in the related systems.
- compute continuous and discrete time convolutions and transform them into problems in the frequency domain.
- compute the Fourier transform of a continuous time signal of finite energy.

- compute the Fourier series of a continuous periodic signal.
- compute the Z transform and the discrete time Fourier transform of discrete time signals.
- apply the theory to 1D sound/speech signals.
- use related software for basic signal processing.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Working independently
- Team work
- Production of free, creative and inductive thinking
- Combining scientific/engineering methods for problem solving

SYLLABUS

Introduction to the theory of signals and systems: continuous time and discrete time signals and systems, special signals, classification of signals and systems, linear and time invariant systems.

Response of linear systems: impulse response of continuous and discrete time linear and time invariant systems, convolution, properties of convolution, transfer function and frequency response of systems, stability.

The Fourier transform: definition and properties of the Fourier transform, analysis of continuous linear and time invariant systems using with the Fourier transform, Fourier series, relation between the Fourier transform and Fourier series.

The Z transform: definition and properties of Z transform, analysis of discrete linear and time invariant systems using with the Z transform, discrete time Fourier transform, analysis of discrete linear and time invariant systems using with the discrete time Fourier transform.

Discrete Fourier transform (DFT): definition and properties of DFT, linear and circular convolution of discrete time signals, fast Fourier transform (FFT).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, lab courses
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education,*	• Use of projector and interactive board during lectures.

communication with students	• Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs). • Announcement of grades via the ecourse platform of UOI. • Use of email and social media for information exchange and improved communication with students.

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

Activity	***Semester workload***
Lectures	13*4 = 52 ώρες
Labs	6*2 = 12 ώρες
Self-study	98,5 ώρες
Course total	***162,5 ώρες***

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.

LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION

The evaluation procedure is described at the course web page and includes:
(i) Final examination (70%).
(ii) Lab assignments (30%).

ATTACHED BIBLIOGRAPHY

-Προτεινόμενη Βιβλιογραφία :

Βιβλίο [31326]: Σ. Θεοδωρίδης, Κ. Μπερμπερίδης, Ε. Κοφίδης. Εισαγωγή στη θεωρία σημάτων και συστημάτων. Δαρδανός 2003.
Βιβλίο [18548733]: Αθ. Μάργαρης. Σήματα και Συστήματα. εκδόσεις Τζιόλα 2011.
Βιβλίο [86057371]: Επεξεργασία σήματος συνεχούς και διακριτού χρόνου, Καφεντζής Γεώργιος, Δαρδανός, 1η/2019.

-Συναφή επιστημονικά περιοδικά:

- IEEE Transactions on Signal Processing.
- IEEE Transactions on Image Processing.
  IEEE Transactions on Communications.

MYY504. Computational Mathematics

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY504**	**SEMESTER**	**5**
COURSE TITLE	Computational Mathematics		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**5**	**6**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=1731

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course objectives are to:

- Presentation and analysis of system modeling examples using differential equations.
- Understanding the basic facts for initial value problems.
- Solving some elementary differential equations and systems of linear differential equations
- Understanding the fundamental qualitative characteristics of numerical methods for initial value problems.
- Familiarity with the basic numerical methods for initial value problems.

After successful attendance of the course the students are expected to:

- Understand the importance of differential equations in system modeling
- Understand the basic facts for initial value problems and can solve some elementary differential equations and systems of linear differential equations.
- Understand the role of consistency, order of accuracy and stability of numerical methods for initial value problems.
- Know the basic numerical methods for initial value problems.
- Are in a position to implement these numerical methods in a computer.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*

- Production of free, creative and inductive thinking
- Decision-making.
- Team work.
- Abstraction ability for problem modeling.
- Search for, analysis and synthesis of data and information, with the use of the necessary technology.

SYLLABUS

System modeling: Examples of system modeling using linear differential equations.
The initial value problem (IVP) for ordinary differential equations: Existence and uniqueness of solutions. Differential equations of separable variables, homogeneous, and exact equations. Systems of linear differential equations.
Numerical methods for initial value problems: Euler's method: stability and consistency properties and error estimates.
Runge-Kutta method: solvability, stability and consistency properties, and error estimates.
Multistep methods: stability and consistency properties, and error estimates. Advantages and drawbacks of Runge-Kutta and multistep methods.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, seminars, team projects
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector and laptop during lectures. • Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, exercises, example programs). • Announcement of assessment marks via the ecourse platform by UOI.
TEACHING METHODS	***Activity*** | ***Semester workload***

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*	Lectures: 13*4 = 52 hours Self-study: 98 hours ***Course total: 150 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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final written examination (80-90%). (ii) Team project (10-20%). The evaluation procedure is accessible to students via the course website.

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Book [59366690]: Αριθμητικές Μέθοδοι για Συνήθεις Διαφορικές Εξισώσεις. Γ. Δ. Ακρίβης, Β. Α. Δουγαλής. Πανεπιστημιακές Εκδόσεις Κρήτης, Ηράκλειο. Δεύτερη έκδοση, 2013, πρώτη ανατύπωση, 2015.

Book [12867996]: Αριθμητική Ανάλυση: Συνήθεις Διαφορικές Εξισώσεις. Μ. Ν. Βραχάτης. Εκδόσεις Κλειδάριθμος, Αθήνα, 2012.

MYY505. Computer Architecture

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY505**	**SEMESTER**	**5**
COURSE TITLE	Computer Architecture		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**5**	**6**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=995

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The primary aim of the course is to convey an understanding of the internal structure and implementation of digital computers. To impart this knowledge, we first explain how the interface between hardware and software is typically constructed: the machine language.

After successfully passing this course the students will be able to:

- Identify the building blocks of a computer system
- Sketch the design of a simple processor and explain how it operates.
- Demonstrate an understanding of memory hierarchy, how it is organized and used.
- Develop and test programs in assembly language.
- Evaluate programs written in assembly language.

- Demonstrate an understanding of the organization of a microprocessor and a pipelined implementation.
- Demonstrate an understanding of current concepts in the organization of a microprocessor.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary techniques
- Algorithmic thinking
- Use abstraction to understand and analyze complex systems/problems
- Working independently
- Adapting to new situations
- Communicate information, ideas, problems and solutions to experts in the field

SYLLABUS

Instruction Set Architecture: Machine language: Instructions for data processing, memory transfer, program flow control. Registers and memory addressing. Assembly programming. Instruction encoding. Addressing modes. Subroutine call and return. Register use conventions. System stack. Compilation, static/dynamic linking

Processor core organization: Basic structure. Instruction execution cycle. Basic digital circuits. Design of arithmetic Logic Unit. Core micro-architecture. Design of datapath and control unit. Performance evaluation. Pipelining, instruction dependencies, pipeline hazards. Implementation of pipelined core. Micro-programmed control.

Memory subsystem: Locality of references. Memory hierarchy. Cache memories: organization and operation. Performance evaluation of cache memory. Virtual memory.

Input-output subsystem: Reliability. Input/output devices and principles of operation. Programmer's model of I/O. Interrupts. Timing and arbitration of busses.

Introduction to modern computer architecture: Instruction-level parallelism. Branch prediction. Speculative execution. Dynamic/static superscalar processors. Out of order execution. Parallel processors. Multi-threaded processors. Graphics processor units.

Lab preparation: Version control using git and github. Verilog hardware description language.

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Lectures</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>

Use of Github repositories for maintenance, distribution of starter programs and collection of lab assignments.
Use of the piazza.com Q&A platform and email for information exchange and improved communication with students.
Use of integrated development environment (IDE) for assembly programming and electronic design automation (EDA) software for the design and simulation of digital circuits.
Course website maintenance. Announcements and posting of teaching material (lecture slides and notes).
Use of projector and interactive board during lectures.
Announcement of assessment marks via the ecourse platform by UOI.

</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>13*4 = 52 hours</td></tr>
<tr><td>Labs</td><td>9*3= 27 hours</td></tr>
<tr><td>Self-study</td><td>71 hours</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></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>LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION
(i) Final examination, which includes argument development questions for problem solving and assembly program development.
(ii) Laboratory exercises of three main types: a) assembly program development and testing, b) design and simulation-based verification of a simple processor, c) development and use of simple simulators. The exercises are evaluated based on correctness, completeness and, in some instances, speed of execution.
The evaluation procedure is accessible to students via</td></tr>
</table>

	the course website.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [68370526]: Νικολός: Αρχιτεκτονική Υπολογιστών.

Book [12561945]: Patterson, Hennessy: Οργάνωση και σχεδίαση υπολογιστών: η διασύνδεση υλικού και λογισμικού.

Book [13759]: Tanenbaum: Η αρχιτεκτονική των υπολογιστών: μια δομημένη προσέγγιση.

Book [15120]: Hammacher, Vranesic, Zaky: Οργάνωση και αρχιτεκτονική ηλεκτρονικών υπολογιστών.

- Related academic journals:

- IEEE Micro, IEEE Computer Architecture Letters, IEEE Transactions on Computers
- Transactions on Architecture and Code Optimization, Transactions on Computer Systems, ACM.
- Microprocessors and Microsystems, Journal of Systems Architecture, Elsevier.

MYY601. Operating Systems

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**MYY601**	**SEMESTER**	**6**	
COURSE TITLE	Operating Systems			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures / Labs / Tutorials		**6**	**5**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background			
PREREQUISITE COURSES:	-			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	http://www.cse.uoi.gr/~stergios/teaching/myy601/			

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course aims to cover at theoretical and laboratory level (a) the internal design of the kernel of an operating system, (b) the service offered by the operating system for the programming of applications, (c) the interaction of the operating system with the hardware. At the completion of attending the course, the student is expected to:

- Have a deep understanding of the interface to the applications and the hardware along with the internal software architecture of a typical operating system.
- Knows the design and programming options of the software of the operating system in topics about processes, concurrency, scheduling, memory, input/output, files and security.
- Can program applications with use of systems calls to the operating system.
- Has the ability to design software and write code that introduces or enhances operations inside the kernel of an operating system.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	……

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Development of complete solutions to complex problems
- Decision making
- Working independently
- Team work
- Production of free, creative and inductive thinking

SYLLABUS

Introduction to operating systems evolution, achievements, structure, modern characteristics, Unix, Linux, Android

Processes state models, process control block, execution modes of process and operating system, basic system calls of Unix

Threads multithreading, user-level and kernel-level threads, Amdahl's law, Solaris, Linux, Windows, Android, Pthreads

Mutual exclusion race conditions, problem abstraction, algorithms of Dekker and Peterson, hardware-based solutions, hardware-based solutions, Pthreads

Synchronization semaphores, monitors, message exchange, mutual exclusion, producer-consumer, readers-writers

Deadlock resources, conditions, modelling, prevention, avoidance, detection, dining philosophers

Scheduling models, criteria, algorithms, parallel thread scheduling

Memory management relocation, partitioning, fit, buddy system, paging, segmentation, linking, binding

Virtual memory caching, paging, translation lookaside buffer, segmentation, replacement, working set model, thrashing, Unix, Linux, Intel, Windows

Input/output hardware, interface, buffer, solid-state drive and flash technology, magnetic disk, disk scheduling, disk arrays, buffer cache

File systems storage methods, directory structure, protection, space allocation, index structure, backup

Security resource protection, access table, threats, password, internal attacks, malware, buffer overflow, virus, spyware, rootkit, multi-level security

Programming development of multithreading in a data storage system and development of activity logging in a file system, both in the Linux environment

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Lectures, lab courses</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Use of projector and interactive board during lectures.
• Use of computers over virtualization in laboratories for software development.
• Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs).
• Announcement of assessment marks via the ecourse platform by UOI.
• Use of email and forum for information exchange and improved communication with students.</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>13*4 = 52 hours</td></tr>
<tr><td>Labs</td><td>13*2 = 26 hours</td></tr>
<tr><td>Self-study</td><td>47 hours</td></tr>
<tr><td>Lab programming at home</td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>125 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>LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION
(i) Final examination, which includes questions with short answers and problem solving (70% w/out midterm, 50% with midterm)
(ii) One optional midterm exam with questions of short answers and problem solving (20% optional)
(iii) Marking of take-home laboratory assignments (30%).</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Textbook [68374433]: Λειτουργικά Συστήματα, William Stallings, 9η Έκδοση, 2017

Textbook [77108683]: Σύγχρονα Λειτουργικά Συστήματα, Andrew S. Tanenbaum, Herbert Bos, 4η Έκδοση, 2018

Textbook [102070659]: Λειτουργικά Συστήματα, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 10η Έκδοση, 2021

- Related academic journals:

- ACM Transactions on Computer Systems

MYY602. Artificial Intelligence

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERINGS		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY602**	**SEMESTER**	**6**
COURSE TITLE	Artificial Intelligence		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures/Laboratory Exercices		5	6.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special Background		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://www.cse.uoi.gr/~arly/courses/ai/ai.html		

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course objective is to make students familiar with the Artificial Intelligence problems and methods and to give students an understanding of the basic issues related to blind and heuristic search methods as well to knowledge representation and reasoning. Another course objective is to provide students with basic knowledge of backward chaining inference systems (Prolog) and forward chaining inference systems (CLIPS) for knowledge representation and reasoning. Finally, the course also aims to provide introductory knowledge on machine learning problems.

It is expected that after taking the course the student will be able to:

- model real-world problems as search problems and solve them using appropriate search methods
- solve constraint satisfaction problems
- apply the major steps of knowledge engineering
- use of an appropriate knowledge representation system for knowledge specification and reasoning and build decision trees for classification problems.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- 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
- Team Work

SYLLABUS

Introduction to Artificial Intelligence, search problems, blind search methods, heuristic search methods, constraint satisfaction, introduction to games, knowledge representation and reasoning, propositional and first order logic, Prolog, CLIPS, knowledge engineering, learning from data, decision trees, reasoning under uncertainty, belief networks, fuzzy systems.

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*	Lecture slides, multimedia (video demonstrations), e-mail communication, course Web page maintenance.
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*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of*	Language of evaluation: Greek Methods of Evaluation:

Activity	***Semester workload***
Lectures	13x3=39 hours
Laboratory practice	13x2=26 hours
Student's study hours	60 hours
Course total	***125 hours***

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.*	i) Final written examination ii) Lab projects examination The evaluation procedure is accessible to students via the course website.

ATTACHED BIBLIOGRAPHY

Book (in Greek): Ι. Βλαχάβας, Π. Κεφαλάς, Ν. Βασιλειάδης, Φ. Κόκκορας, Η. Σακελλαρίου. «Τεχνητή Νοημοσύνη», ISBN: 978-960-8396-64-7, Εκδόσεις Πανεπιστημίου Μακεδονίας, 2011.

Book (in Greek): S. Russel, P. Norvig, «Τεχνητή Νοημοσύνη: Μια σύγχρονη προσέγγιση», ISBN: 960-209-873-2, Εκδόσεις Κλειδάριθμος, 2005..

MYY603. Communication Systems

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY603**	**SEMESTER**	**6**
COURSE TITLE	Communication Systems		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**6**	**6.5**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised general knowledge
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=1038

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The goal of the course is the introduction of the student to analog and digital communication systems. The main core of the course is the presentation of the basic types of analog and digital modulation schemes. The course gives more emphasis to basic communication theory rather than specific hardware implementations.

After successfully passing this course the students will be able to:

- Analyze and design analog communication systems.
- Analyze the effects of noise in analog communication systems.
- Understand the basic principles of analog to digital signal conversion.
- Analyze and design digital communication systems.
- Calculate the probability of error in digital communication systems.
- Understand the basic multiple access techniques.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	……

- 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
- Evaluation of different solutions and selection of the most appropriate one
- Use of structured mathematical thinking for the development and reinforcement of arguments

SYLLABUS

Analog communications: Amplitude modulation (DSB, AM, SSB). Angle modulation (FM, PM). Effects of noise in analog communications

Analog to digital signal conversion: Nyquist theorem. Quantization.

Digital communications: Geometrical signal representation. Optimal detection in AWGN channels. Probability of error in AWGN channels. Digital modulation techniques (PAM, PSK, QAM, FSK, MSK).

Multiple access techniques: FDMA, TDMA, CDMA.

Laboratory: Lab exercises (using special hardware) concerning ASK, FSK, PSK, and CDMA modulation and demodulation.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, lab sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector during lectures. • Use of Matlab or Octave in homework assignments. • Use of the ecourse electronic platform for course announcements, uploading of class notes, homework assignment, and grade announcement. • Use of email and social media for more effective communication with the students
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice,*	

Activity	***Semester workload***
Lectures	13*4 = 52 hours
Labs	3*2 = 6 hours

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*	Self-study: 67 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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final examination (80%). The students are asked to solve problems of analysis and design of communication systems. (ii) Homework assignments (20%). The students are asked to solve problems of analysis and design of communication systems. (iii) Laboratory (Pass/Fail). Lab attendance is mandatory. Students turn in a report at the conclusion of each lab. The evaluation procedure is accessible to students via the course website.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [22769688]: Βασικές Αρχές Συστημάτων Επικοινωνίας, Michael P. Fitz

Book [68369851]: Τηλεπικοινωνιακά Συστήματα, 4η Έκδοση, Καραγιαννίδης Γιώργος, Παππή Κοραλία

Book [41956308]: Συστήματα Επικοινωνιών, Carlson/Crilly

Book [9778]: Συστήματα Επικοινωνίας, Simon Haykin, Michael Moher

Book [18548860]: Αρχές τηλεπικοινωνιακών συστημάτων, Taub Herbert 1918-,Schilling Donald L.

Book [59421499]: Σύγχρονες Αναλογικές και Ψηφιακές Επικοινωνίες, 4η Εκδοση, Lathi P. B. - Ding Zhi, Παναγόπουλος Αθανάσιος (επιμέλεια)

- Related academic journals:

- IEEE Transactions on Communications
- IEEE Communications Magazine
- IEEE Transactions on Wireless Communications

MYY701. Database Systems

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**MYY701**	**SEMESTER**	**7**	
COURSE TITLE	Database Systems			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials			**6**	**6.5**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background			
PREREQUISITE COURSES:	-			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	http://www.cse.uoi.gr/~pitoura/courses/db/db20/ http://ecourse.uoi.gr/course/view.php?id=746			

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course aims at introducing database management fundamentals, presenting the basic functionality and modules of a relational database management system and teaching students how to design and program database applications.

After successfully passing this course the students will be able to:

- Design a database schema using the entity/relationship and the relational models
- Write queries in relational algebra and relational calculus
- Design and implement database applications in SQL using a relational database management system
- Characterize the quality of a database schema using normal forms and functional dependencies
- Apply basic principles, techniques, data structures and algorithms for the efficient

storage and retrieval of large amounts of data

- Use appropriate indexes (B+-trees, external hashing, etc.) for efficient data retrieval
- Understand the structure of a relational database management system
- Leverage query processing principles towards writing efficient SQL queries

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Analysis of requirements for problem solving
- Algorithmic thinking
- Abstraction ability for problem modeling
- Working independently
- Team work

SYLLABUS

Introduction to databases: database management systems, general principles, types of database management systems, users of database systems, data independence, historical perspectives

Database design and database models: conceptual design, the entity/relationship model, the relational model

Relational algebra and relational calculus: the select, project, join and set operators, tuple relational calculus.

SQL programming: data definition language, data manipulation, SPJ queries, nested queries, aggregation

Database design theory: Functional dependencies, normal forms, decomposition properties

Storage and querying processing: memory hierarchy, file structures, access methods, query optimization.

Indexes: index types, B+-trees, hashing

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Weekly lectures, lab sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of online material and interactive board in lectures. • Database programming using database management systems. • Course web site, announcement and posting of

	teaching material (lecture slides, notes, SQL programs) • Announcement of grades via the UOI ecourse platform • Use of email and social media for information exchange and improved communication with students.
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*	
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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final exam which includes short-answer questions, and problem solving (ii) Database programming assignments. Students are evaluated for the correctness, accuracy and quality of their design and the efficiency of their queries (iii) Written assignments. Students are evaluated based on the correctness and completeness of their answers. The detailed evaluation procedure is accessible to students at the course website.

Activity	***Semester workload***
Lectures	13*4 = 52 hours
Labs	13*2 = 26 hours
Self-study	47 hours
Course total	***125 hours***

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Βιβλίο [22694245]: Συστήματα Διαχείρισης Βάσεων Δεδομένων, 3η Έκδοση, Ramakrishnan Raghu, Gehrke Joahannes, Εκδόσεις 2012

Βιβλίο [102070677]: Συστήματα Βάσεων Δεδομένων 7η Έκδοση, Abraham Silberschatz,Henry F. Korth,S. Sudarshan, Εκδόσεις Γκιούρδα, 2011

- Related academic journals:

- ACM Transactions on Database Systems (TODS).
- IEEE Transactions on Knowledge and Data Engineering (TKDE)
- The VLDB Journal, Springer

MYY702. Computer Graphics and Interactive Systems

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY702**	**SEMESTER**	**7**
COURSE TITLE	Computer Graphics and Interactive Systems		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**4/2/0**	**6.5**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=13

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Learning of principles, algorithms and techniques for developing graphics tools, interactive software and visualization systems. Acquire the ability to design and develop software for rendering, interaction and visualization.

After successfully passing this course the students will be able to:

- Understand how graphics hardware works.
- Comprehend the basic principles of human computer interaction.
- Modeling 2D and 3D objects and develop data structures for representing them.
- Become acquainted with the principles and methods for creating 2D graphics (digital differential analyzer, scan conversion, integer arithmetic, parametric representation, pre and post filtering, filling and clipping)
- Understand the definition and use of 2D and 3D affine transformations
- Acquire knowledge regarding the 3D rendering pipeline.

- Understand the foundations of color and light and the approaches to approximate these effects in 3D rendering.
- Know the basics of virtual reality and real time graphics

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking
- Team work
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Analysis of requirements for problem solving
- Algorithmic thinking
- Working independently
- Ability to design and develop medium scale software projects

SYLLABUS

- Introduction.
- Image processing and mathematics preliminaries for computer graphics.
- Graphics and interaction hardware.
- Modeling the human and the human-computer interaction.
- Modeling cognitive processing, response and interaction.
- Basic raster algorithms for drawing 2D primitives (raster scan, filling, clipping, antialiasing).
- 2D and 3D geometrical transformations.
- Graphical User Interfaces. Interactive methods for providing input. Simple 2D graphics libraries.
- 3D Graphics. Projections and viewing transformations. Solid modeling.
- Color models and illumination.
- Software libraries for 3D rendering.
- Introduction to virtual reality.
- Interaction libraries for providing input/output in 3D.
- Programming assignments.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, lab courses, alternative for distance learning through pre-recorded lectures available through

<table>
<tr><td></td><td>streaming video.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Use of projector and interactive board during lectures.
• Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs).
• Announcement of assessment marks via the ecourse platform by UOI.
• Use of email and forums for information exchange and improved communication with students.
• Use of asynchronous platform for distance learning (moodle)</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>13*4 = 52 hours</td></tr>
<tr><td>Labs</td><td>13*2 = 26 hours</td></tr>
<tr><td>Self-study</td><td>47 hours</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>125 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>LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION
(i) Final examination, which includes questions for applying principles, theory and foundations to solve graphics problems. The exam papers are evaluated based on the correctness and completeness of answers.
(ii) Two take-home programming assignments. The assignments are marked based on their correctness and completeness.
The evaluation procedure is accessible to students via the course website.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [86195186]: ΓΡΑΦΙΚΑ ΚΑΙ ΟΠΤΙΚΟΠΟΙΗΣΗ, Θεοχάρης Θ, Παπαϊωάννου Γ, Πλατής Ν., Πατρικαλάκης Ν.

Βιβλίο [94701919]: Γραφικά Υπολογιστών με Open GL, 4η Έκδοση, Baker, Hearn, Carithers

Book: V. Anand. Computer Graphics and Geometric Modeling for Engineers. John Wiley& Sons Inc, 1993, ISBN: 0-471-51417-9.

Book: J. Foley, A. van Dam, S. K. Feiner, J. F. Hughes. Computer Graphics, Principles and Practice, Second Edition in C. Addison Wesley, 1996, ISBN: 0-201-84840-6.

Book: G. Glaeser. Fast Algorithms for 3D-Graphics. Springer Verlag, 1994, ISBN: 0-387-94288-2.

Book: C. M. Hoffmann. Geometric and Solid Modeling. Morgan Kaufmann, 1989, ISBN: 1-55860-067-1.

Book: Marv Luse. Applied Graphics Algorithms. Addison Wesley, 1995, ISBN: 0-201-40845-7.

Book: W. Schroeder, K. Martin, B. Lorensen. The Data Visualization Toolkit: An Object-Oriented Approach to 3D Graphics. Prentice Hall, 1996, ISBN: 0-13-199837-4.

Book: Alan Watt. 3D Computer Graphics, Third Edition. Addison Wesley, 2000.

Book: 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. **Publisher:** Addison-Wesley Professional, 2007, ISBN-10: 0321481003, ISBN-13: 978-0321481009

Related academic journals:

- Computer Graphics Forum, Wiley-Blackwell, the official journal of Eurographics
- ACM Transaction on Graphics, ACM
- IEEE Transactions on Visualization and Computer Graphics, IEEE

MYY703. Computer Networks I

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY703**	**SEMESTER**	**7**
COURSE TITLE	Computer Networks		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures / Labs / Tutorials	**6**	**7**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://www.cse.uoi.gr/~epap/MYY703		

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course provides an introduction to computer networking. It analyses the theoretical principles in computer networking and provides practical information regarding well-known networking technologies. To this end, the course discusses the basic design and architectural concepts of state-of-the-art computer networks. The course also provides an insight on the fundamental networking principles that lie beneath well-known and widely adopted networking protocols. At the same time, the course provides a detailed description of the most successful networking paradigms from local area networks to the Internet in order to: a) explain the practical implementation of theoretical networking principles in real-life networks, and b) provide practical information on widely used networking technologies.

After successfully passing this course the students will be able to:

- understand the fundamental design principles of networks (e.g. layered design).
- understand the network mechanisms (protocols in different OSI layers) and their combined operation to provide a specific network service.
- understand the role of different types of networks, be able to identify them and describe the underlying networking principles.
- understand and explain the operation of and the services provided by typical network types (e.g. local networks, switching networks, etc) as well as by typical network technologies (e.g. Ethernet networks, IP networks, etc).
- evaluate the operational parameters and the performance of a network.
- choose the optimal parameter setting for a network in order to achieve the desired performance.
- choose and combine known networking concepts for creating a network that meets specific performance requirements.
- understand and foresee new trends in computer networks technology

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Analysis of requirements for problem solving
- Algorithmic thinking
- Abstraction ability for problem modeling
- Working independently
- Team work

SYLLABUS

Introduction to networking. History of network technologies and the Internet. Network architectures, types and topologies. Network Design: layered protocol design, network protocols and standards, connection-oriented and connectionless services, the OSI Reference model. Physical layer concepts: bandwidth, throughput, encoding and modulation, transmission media, error detection and correction, multiplexing. Data Link layer: framing, error control (ARQ protocols). Medium Access Control concepts: addressing, contention-based and contention-less multiple access, LAN technologies (Aloha, Ethernet, Token Ring, Token Bus, FDDI, IEEE802.11), Repeaters, bridges and hubs. Switched Networks: packet switching and virtual circuits, other switching techniques, layer-2 and layer-3 switches. Internetworking: routing. Congestion control. Introduction to Queueing systems.

Transport Layer.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, lab courses
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector and interactive board during lectures. • Use of computers and networking facilities in laboratories. • Course website maintenance. Announcements and posting of teaching material (lecture slides and lab notes, programs). • Announcement of assessment marks via the course webpage. • Use of email and social media for information exchange and improved communication with students.
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*	
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.*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) Final examination, which includes questions and problem solving. (ii) Laboratory exercises. The evaluation procedure is accessible to students via the course website.

Activity	***Semester workload***
Lectures	13*4 = 52 hours
Labs	13*2 = 26 hours
Self-study	47 hours
Course total	***125 hours***

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Book [22771742]: ΔΙΚΤΥΑ ΕΠΙΚΟΙΝΩΝΙΩΝ, ΕΝΑ ΠΡΩΤΟ ΜΑΘΗΜΑ, JEANWALRAND

Book [13954]: ΔΙΚΤΥΑ ΥΠΟΛΟΓΙΣΤΩΝ: ΜΙΑ ΠΡΟΣΕΓΓΙΣΗ ΑΠΟ ΤΗ ΣΚΟΠΙΑ ΤΩΝ ΣΥΣΤΗΜΑΤΩΝ, LARRYL. PETERSON, BRUCES. DAVIE
Book [102070624]: Δικτύωση Υπολογιστών, 8η Έκδοση, J.F. Kurose, K.W. Ross
Book [102070446]: ΔΙΚΤΥΑ ΥΠΟΛΟΓΙΣΤΩΝ, ANDREW S. TANENBAUM, DAVID J. WETHERALL

- *Related academic journals:*

- IEEE/ACM Transactions on Networking (TON), IEEE.
- IEEE Network, IEEE.
- IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS (J-SAC), IEEE.
- Computer Networks: The International Journal of Computer and Telecommunications Networking, ELSEVIER.
- Computer Communications: The International Journal for the Computer and Telecommunications Industry, ELSEVIER.
- Computer Communications Review, ACM.

MYY801. Computer Networks II

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY801**	**SEMESTER**	**8**
COURSE TITLE	Computer Networks II		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**5**	**6.5**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=1831

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The Computer Networks II course aims to introduce students to the technologies underlying the Internet and to offer the theoretical and technical background that will allow them to effectively using these technologies.

After successfully passing this course the students will be able to:

- Understand the fundamental principles underlying the Internet.
- Understand and be able to explain the operation of the main protocols of the TCP/IP reference model.
- Implement networked applications using the BSD Sockets API.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

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* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Analysis of requirements for problem solving
- Ability to abstract and model problems
- Working independently

SYLLABUS

Introduction to Computer Networks and the Internet: Review of basic principles of Computer Networks, the TCP/IP reference model, and models of networked applications.

Network layer: The IP protocol, service model, addressing, the Dijkstra and Bellman-Ford routing algorithms, the RIP, OSPF, and BGP routing protocols, the ICMP protocol, IP multicasting using IGMP.

Transport layer: Service model, connectionless and connection-oriented communication at transport level, principles of reliable data transport, UDP and TCP protocols, reliable communication over TCP, principles of congestion control, TCP congestion control.

Application layer: Examples of application protocols: HTTP, FTP, SMTP, the Internet directory service, the DNS protocol, programming networked applications using the BSD Sockets API.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, lab courses
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector and interactive board during lectures. • Use of networked computers in laboratories for development and testing of networked application software. • Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs). • Announcement of course grades via the UOI electronic course administration system. • Use of email for information exchange and improved communication with students.

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

Activity	***Semester workload***
Lectures	13*3 = 39 hours
Labs	13*2 = 26 hours
Self-study	60 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.

LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION
(i) Final examination, including open-ended questions and problem solving.
(ii) Laboratory exercises in program development and testing, and oral examination on them by course staff.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [13954]: Δίκτυα Υπολογιστών: Μια προσέγγιση από τη σκοπιά των συστημάτων, Larry L. Peterson, Bruce S. Davie, Εκδόσεις Κλειδάριθμος, 2009, 4η Έκδοση

Book [102070624]: Δικτύωση Υπολογιστών, J. F. Kurose, K. W. Ross, Εκδόσεις Γκιούρδα, 2018, 8η Έκδοση

- Related academic journals:

- ACM/IEEE Transactions on Networking.
- ACM SIGCOMM Computer Communication Review.

MYY802. Compilers

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY802**	**SEMESTER**	**8**
COURSE TITLE	Compilers		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Labs / Tutorials	**4 / 2 / 0**	**6.5**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=543

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course “Compilers” offers important qualifications to the students of a Computer Science and Engineering Department. Even if it is very likely that the students will not use this knowledge to find a job in the compiler development industry, this course will give them knowledge and experiences necessary in the field of software development.

The students will not use any more the programming language as a tool, without knowing the details of the underlying process, with which a source code written in a high level programming language is translated to assembly code, a low level representation executed directly by the hardware. The students do not only get a theoretical background on compiler construction, but they are requested to cooperate with each other and develop a fully working educational compiler, which compiles a Pascal-like programming language to

assembly code.

After completing the course, the students will be able to:

- Understand the basic concepts of the compiler construction theory
- Design a new programming language
- Write a grammar for a specific programming language
- Perform lexical analysis in a program
- Implement a recursive descent parser
- Decompose complicated programming structures into simpler ones
- Transform a program written in a high level procedural programming language to an another high level programming language
- Extract information from source code related to data structures used and organize this information to be easily accessed
- Produce machine code, based on the above
- Apply code optimization techniques in various levels of the compilation process (i.e. on the source code, on the intermediate representation or on the machine code)
- Start using meta-compiler tools for compiler construction
- Develop programs based on the compiler construction technology (i.e. calculators, software for data mining from text, etc.)
- Use their acquired background to further invest and investigate the field

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Production of free, creative and inductive thinking
- Acquisition of skills and experiences in software development
- Acquisition of skills and experiences in automatic code generation
- Deeper look in a computing system architecture
- Algorithmic thinking
- Team work

SYLLABUS

Introduction to complier construction technology:: Programming languages, code compilation, meta-compiler tools, software composition, terminology, requirements, compilation phases, compiler organization

Lexical analysis: automata, regular expressions, lexical analyzer's internal structure, the flex

meta-compiler tool

Syntactic analysis: Syntax analyzer, LL(1) grammars, syntax directed compilation, the Bison meta-compiler tool

Semantic analysis: Semantic analysis in the compilation process

Intermediate code generation: Intermediate language, arithmetic expression, logic expressions, programming structures (decision, loops, etc), procedures and functions

Symbol table and memory management: Organization of a symbol table, activation record, access to information stored in a symbol table, alternative organizations based on the requirements of a specific language

Final code generation: Machine code, intermediate code generation for branches, expressions, memory access, function calls and parameter passing

Code optimization: organization of an optimizing compiler, control flow and data flow analysis, algebraic transformations, loop transformations, subprograms transformations

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of projector and interactive board during lectures. • Course website maintenance for posting: • Announcements • Slides • Programming projects • Suggestions from the literature • Announcement of assessment and examination results via web 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 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*	LANGUAGE OF EVALUATION: Greek METHODS OF EVALUATION (i) programming project evaluation (ii) oral examination (iii) final written examination

Activity	***Semester workload***
Lectures	13*4 = 52 hours
Labs	13*2 = 26 hours
Self-study	47 hours
Course total	***125 hours***

examination of patient, art interpretation, other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	The evaluation criteria and all rules related to the exams are announced during the first lecture of the semester and are also available through the web platform.

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Book [45346]: Μεταγλωττιστές, Ν. Παπασπύρου, Ε. Σκορδαλάκης

Book [12713790]: Μεταγλωττιστές, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman

Book [77108866]: ΣΧΕΔΙΑΣΗ ΚΑΙ ΚΑΤΑΣΚΕΥΗ ΜΕΤΑΓΛΩΤΤΙΣΤΩΝ, Keith D. Cooper, Linda Torczon

- *Related academic journals:*

ACM Transactions on Programming Languages and Systems (TOPLAS).

MYY803. Software Engineering

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERINGS			
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**MYY803**	**SEMESTER**	**7**	
COURSE TITLE	Software Engineering			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory exercises			**5**	**7**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background			
PREREQUISITE COURSES:	-			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	http://www.cs.uoi.gr/~zarras/se.htm			

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The main objective of this course is the study and application of systematic processes, methods and techniques for software design, implementation and testing.

The main outcomes of the course is that the students will be capable to:

- Elicit, analyze and specify requirements for a large scale software system.
- Specify the architecture of the system based on the requirements specification.
- Design and implement the subsystems of the system's architecture.
- Test the system in a principled way that guarantees the quality of the result.
- Organize the delivery of the system and the user's training.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology

Project planning and management

Respect for difference and multiculturalism

Adapting to new situations	*Respect for the natural environment*
Decision-making	*Showing social, professional and ethical responsibility and*
Working independently	*sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search for, analysis, and synthesize of data and information, , with the use of the necessary technology.
- Decision making.
- Team work.
- Project planning and management.
- Ability to abstract and model problems.

SYLLABUS

This course focuses on issues related to software lifecycle in general and to the individual phases that constitute the software lifecycle. More specifically, the course consists of the following parts.

Software development processes and process modeling: Basic concepts, code and fix model, waterfall model, operational requirements specification model, transformation model, evolutionary development process, spiral model.

Requirements analysis: Basic concepts, types of requirements, requirements properties, requirements elicitation and analysis, requirements documentation and modeling (use cases, data flow diagrams, decision tables, state charts, etc.), requirements verification, validation and quality.

Software architecture and design: basic concepts, software architecture and technical design, object-oriented design (package diagrams, class diagrams, sequence diagrams, etc.), design verification and validation, design quality (cohesion, coupling), object-oriented design metrics (CBO, LCOM, WMC, DIT, NOC, etc.), software architectural styles.

Software implementation: Basic concepts, conventions, standards and best practices for the development of clean code.

Software testing: Basic concepts, types of faults, testing organization (unit testing, integration testing, system testing, acceptance testing), static testing (code walkthroughs, code reviews), dynamic testing, black box testing techniques (boundary value analysis techniques, equivalence class testing, etc.), white box testing techniques (statement testing, branch testing, path testing, dataflow testing, etc.), integration testing techniques (bottom up, top down, big bang, sandwich, etc.), fault prediction techniques, system testing (performance, availability, reliability, etc.).

Software delivery and beyond: Basic concepts, user training issues, documentation issues, software evolution and maintenance issues, etc.

The course also comprises a project that aims at the development of a large software system in groups of 2-3 students. The project consists of different phases (requirements specification, design, implementation, testing, delivery) each one of which has a corresponding deliverable. The objective of the project is to train the students in the use of integrated development environments. The project further focuses on the practical

application of techniques related to the different phases of the project (requirements, design, implementation, testing, delivery).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Weekly lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of transparencies and interactive white board. • Maintenance of a web page dedicated to the course (announcements, reading material, grades, etc.).
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*	

Activity	***Semester workload***
Lectures	13*3 = 39 hours
Laboratory practice	13*2 = 26 hours.
Study hours	60 hours
Course total	***125***

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.*	LANGUAGE: Greek METHOD: 1. Final written exam with questions, problems and practical exercises. 2. Oral examination and evaluation of the different phases of the project (requirements analysis, design, implementation & testing). Information about the specific evaluation process is provided in the course's web page.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Book [13009253]: Software Engineering - Theory & Practice, 2nd Edition, S. L. Pfleeger.
Book [13625]: Software Engineering, 8th Edition, Ian Sommerville.

- Related academic journals:

- IEEE Transaction on Software Engineering
- ACM Transaction on Software Engineering and Methodology
- Information and Software Technology
- Information Systems
- Journal of Systems and Software
- IEEE Software

MYY1000. Diploma Thesis

COURSE OUTLINE

GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MYY1000**	**SEMESTER**	**=>9**
COURSE TITLE	DIPLOMA THESIS		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
		30
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Skills Development - specialised
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek/English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	-
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The Diploma Thesis is a specialized project aimed at the synthesis of knowledge, problem solving, the use of tools and methods in line with the latest developments in research and technology, the learning of techniques, the conduct of research, the study and analysis of bibliography and the analysis and evaluation of results. The Thesis's topic is unique and gives the student the opportunity to get deeper in a specific area of specialization, which is of course part of the broader area of the Computer Science and Engineering discipline.
The Diploma Thesis is conducted on the basis of Engineering Design principles, over a well specific problem (theoretical or practical), whose solution has to be provided on the basis of state-of-the-art techniques, via a creative and open-ended process.
At the end of the Diploma Thesis, the student will be able to:

- Collect and integrate the available information on state-of-the-art techniques in the study area.
- Develop a plan and apply the known theory and methodologies to reach the solution to the given problem.
- Adapt the above techniques and methods to the specificities of the given problem with originality.
- Evaluate alternatives to the given problem and consciously pick one based on the prioritization of the dimensions of the problem.
- Organize and communicate results via a technical report (in the form of a dissertation), which, in addition to being submitted in writing, is also orally defended in a public defense.
- Develop initiatives to facilitate the above tasks, and take responsibility for their achievement.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

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
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……
Others…
…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Working in an interdisciplinary environment
- Project planning and management
- Production of free, creative and inductive thinking
- Project planning and management for Computer Science projects

SYLLABUS

Thesis is an important part of the educational process at the Department. During the preparation of the thesis report students are asked to synthesize their knowledge, apply their skills, apply what they learned during their studies, solve problems and using cutting-edge tools and methods in line with the latest developments in research and technology.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face supervision from a faculty member
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	- Bibliographic search and result integration via the exploitation of online libraries - Use of cutting-edge techniques and tools in the

<table>
<tr><td></td><td>area of Computer Science
- Use of ICT in the defense of thesis</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>Bibliographic search and integration</td><td>150</td></tr>
<tr><td>Solution Design</td><td>150</td></tr>
<tr><td>Solution Implementation</td><td>300</td></tr>
<tr><td>Compilation of the final report</td><td>150</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>750 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>LANGUAGE OF EVALUATION: Greek

METHODS OF EVALUATION
- Dissertation
- Public Defense

The final examination (presentation and marking) of a thesis will follow the end of any examinations period (January, June or September) in a maximum interval of 2 weeks. The student should deposit the written thesis to her/his three-member committee at least 10 days before the presentation date. Attendance to the presentation is open. The Thesis is examined and scored by 3 faculty members.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- R.J. Wieringa. Design Science Methodology for Information Systems and Software Engineering. Springer 2014. DOI 10.1007/978-3-662-43839-8
- Justin Zobel. Writing for Computer Science. Springer 2014. DOI 10.1007/978-1-4471-6639-9
- Diploma Thesis Template, by the Department

- Related academic journals: