UNIVERSITY OF PIRAEUS
DEPARTMENT OF DIGITAL SYSTEMS

CURRICULUM GUIDE
2010–2011

http://www.ds.unipi.gr

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1. UNIVERSITY OF PIRAEUS

1.1 General Description of the Institute

The University of Piraeus was founded in 1938 by the Industrialists and Tradesmen Association, under the title "*School for Industrial Studies*" and it was renamed to "*Graduate School of Industrial Studies*" in 1958. From 1966, it operates as a public Higher Education legal entity and in 1989 it was renamed to "*University of Piraeus*". Today, the University of Piraeus has the following Academic Departments: Economics, Business Administration, Statistics and Insurance Science, Banking and Financial Management, Industrial Management, Maritime Studies, Informatics, Digital Systems, International and European Studies.

All Academic Departments offer both Undergraduate Programmes (4-year long), Postgraduate Programmes (Masters) and Ph.D. Programmes.

Contact Details	
Name:	University of Piraeus
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1.2 Academic Authorities

The Senate of the University of Piraeus consists of the Rector, the Vice-Rectors, the Heads of the Academic Departments, as well as, representatives from the Academic, Research, Technical and Administrative Staff and the Undergraduate and Postgraduate Students.

For academic years 2008-2012:

Rector:	Professor Georgios Oikonomou
Vice-Rectors:	Professor George Vassilacopoulos
	Professor Lambros Laios

1.3 Academic Calendar for the Academic Year 2010-2011

Winter Semester	
Courses Start Date:	Friday 1 October 2010
Courses End Date:	Friday 14 January 2011
Public Holidays:	Thursday 28 October 2010
	Wednesday 17 Νοεμβρίου 2010
	24 December 2010 until 7 January2011 – Christmas Holidays
Winter Semester Exam Period	
Exam Start Date:	Monday 17 January 2011
Exam End Date:	Friday 11 February 2011
Grades Announcement:	Until Friday 11 March 2011
Spring Semester	
Courses Start Date:	Monday 14 February 2011
Courses End Date:	Tuesday 31 May 2011
Public Holidays:	Monday 7 March 2011
	Friday 25 March 2011
	18 until 29 April 2011 – Easter Holidays
Winter Semester Exam Period	
Exams Start Date:	Wednesday 1 June 2011
Exams End Date:	Thursday 30 June 2011
Public Holidays:	Monday 13 June 2011
Grades Announcement:	Until Friday 29 July 2011
Complementary Exam Period	
Exams Start Date:	Thursday 1 September 2011
Exams End Date:	Friday 30 September 2011
Grades Announcement:	Until Monday 31 October 2011

2. DEPARTMENT OF DIGITAL SYSTEMS

2.1 Educational and Professional Goals

The Department of **Digital Systems** was established in *1999* as one of the newest academic departments at the University of Piraeus, in response to the societal demand for higher education academic teaching and research that support the Knowledge Society. The Department of Digital Systems offers one Undergraduate Programme in "Digital Systems" (four-year Programme – 240 ECTS), two Master's Degree (M.Sc.) in "Technology Education and Digital Systems" (started 2004 – 120 ECTS) and "Techno-economics Management and Digital Systems Security" (started 2009 – 90 ECTS) and a Ph.D. Programme.

2.2 Department's Degree Programmes

Undergraduate Programme in "Digital Systems"

This is a four-year undergraduate programme in "Digital Systems" **(240 ECTS)** with two areas of studies, namely:

▶ Communication Systems and Networks
▶ Electronic Services

Postgraduate Programme in "Technology Education and Digital Systems"

This is a postgraduate programme leading to a Master's Degree (M.Sc.) in "Technology Education and Digital Systems" **(120 ECTS)** with three areas of studies, namely:

▶ Digital Communications and Networks
▶ Network Oriented Systems
▶ e-Learning

Postgraduate Programme in "Techno-economics Management and Digital Systems Security"

This is a postgraduate programme leading to a Master's Degree (M.Sc.) in "Techno-economics Management and Digital Systems Security" **(90 ECTS)** with two areas of studies, namely:

▶ Techno-economics Management

▶ Digital Systems Security

Ph.D. Programme

This is a research programme leading to a Ph.D. degree in «Digital Systems» with research focusing namely the following areas:

▶ Network Oriented Systems and Services

▶ Digital Health Services

▶ Telecommunication Networks and Integrated Services

▶ Security Systems

▶ Intelligent Systems and Multimedia Technologies

▶ Telecommunication Systems

▶ Technology – enhanced Learning

2.3 Academic Personnel

I. Professors

George Vassilacopoulos - *Head of Department*

Sokratis Katsikas *- on leave(Greek Government)*

Nikitas-Marinos Sgouros - *Deputy Head of Department*

II. Associate Professors

Panagiotis Demestichas

Athanasios Kanatas

Ioannis Maniatis *- on leave (Greek Parliament)*

Symeon Retalis

Demetrios G. Sampson

III. Assistant Professors

Angeliki Alexiou

George Efthymoglou

Michael Filippakis – *pending appointment*

Costas Lambrinoudakis

Flora Malamateniou

Ilias Maglogiannis – *pending appointment*

Fotini Paraskeva

Andriana Prentza

Angelos Rouskas

Vera-Alexandra Stavroulaki

Marinos Themistocleous

Orestis Telelis – *pending appointment*

Christos Xenakis

IV. Lecturers]

Pantelis-Daniel Arapoglou – *pending appointment*

Christos Doulkeridis – *pending appointment*

Maria Halkidi - *ECTS Coordinator*

Demosthenis Kyriazis – *pending appointment*

Apostolos Meliones - *ERASMUS Coordinator*

2.4 Undergraduate Programme

The Undergraduate Programme in "Digital Systems" lasts for a minimum period of **eight (8) academic semesters** with a total of **fifty (50)** individual courses corresponding to **240 credits** of the European Credit Transfer System (ECTS). The individual courses are divided into the following types:

- ▶ Core Courses **[C]**
- ▶ Compulsory Courses for major "Electronic Services" **[CC-ES]**

▶ Compulsory Courses for major "Communication Systems and Networks" **[CC-CSN]**

▶ Optional Courses for major "Electronic Services" **[OC-ES]**

▶ Optional Courses for major "Communication Systems and Networks" **[OC- CSN]**

▶ Optional Courses for both majors "Electronic Services" and "Communication Systems and Networks" **[OC-ES, OC- CSN]**

▶ Seminar Courses **[SC]**

The structure of the Undergraduate Programme is illustrated in the following figure.
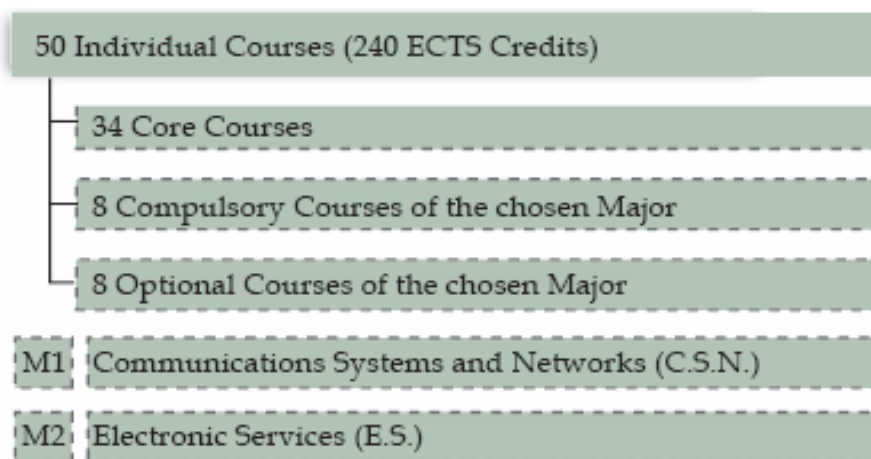
The Undergraduate Programme for the academic year 2010-2011 is summarized in the following table.

Code	Title	Type	Year of Study/ Semester	Theory/ Lab Sessions	ECTS Credits	Academic Personnel
DS 001	Mathematical Analysis I	[C]	1st/ 1st	4/ 0	4	Adjunct Lecturer
DS 010	Probability Theory	[C]	1st/ 1st	4/ 0	4	Adjunct Lecturer
DS 003	Linear Algebra	[C]	1st/ 1st	4/ 0	4	Adjunct Lecturer
DS 501	C Programming	[C]	1st/ 1st	3/ 2	5	Vera-Alexandra Stavroulaki, Assistant Professor
DS 201	Computer Architecture	[C]	1st/ 1st	3/ 2	5	Costas Lambrinoudakis, Assistant Professor
DS 005	Mathematical Logic	[C]	1st/ 1st	4/ 0	4	Apostolos Meliones, Lecturer
DS 706	Instructional Methods	[C]	1st/ 1st	3/ 1	4	Fotini Paraskeva, Assistant Professor
DS 002	Mathematical Analysis II	[C]	1st/ 2nd	4/ 0	4	Adjunct Lecturer
DS 012	Stochastic Processes	[C]	1st/ 2nd	4/ 0	4	Angeliki Alexiou, Assistant Professor
DS 004	Discrete Mathematics	[C]	1st/ 2nd	4/ 0	4	Adjunct Lecturer
DS 202	Operating Systems I	[C]	1st/ 2nd	3/ 2	5	Costas Lambrinoudakis, Assistant Professor

Code	Title	Type	Year of Study/ Semester	Theory/ Lab Sessions	ECTS Credits	Academic Personnel
DS 502	Object-Oriented Programming	[C]	1st / 2nd	3/2	5	Andriana Prentza, Assistant Professor
DS 508	Systems Analysis and Design	[C]	1st / 2nd	3/ 1	4	Andriana Prentza, Assistant Professor
DS 011	Statistics	[C]	1st / 2nd	4/ 0	4	Adjunct Lecturer
DS 205	Operating Systems II – UNIX	[C]	2nd / 3rd	3/ 2	5	Costas Lambrinoudakis, Assistant Professor
DS 301	Introduction to Telecommunications	[C]	2nd / 3rd	3/ 2	5	Athanasios Kanatas, Associate Professor
DS 503	Data Structures	[C]	2nd / 3rd	3/ 2	5	Maria Halkidi, Lecturer
DS 509	Human - Computer Interaction	[C]	2nd / 3rd	3/ 2	5	Symeon Retalis, Associate Professor
DS 805	Information Theory	[C]	2nd / 3rd	3/ 2	5	Christos Xenakis, Assistant Professor
DS 507	Software Engineering	[C]	2nd / 3rd	3/ 2	5	Andriana Prentza, Assistant Professor
DS 504	Database Design	[C]	2nd / 4th	3/ 2	5	George Vassilacopoulos, Professor Maria Halkidi, Lecturer
DS 510	Web Programming	[C]	2nd / 4th	3/ 2	5	Symeon Retails, Associate Professor
DS 402	Multimedia Technology	[C]	2nd / 4th	3/ 2	5	Nikitas-Marinos Sgouros, Professor
DS 207	Distributed Systems	[C]	2nd / 4th	3/ 2	5	Apostolos Meliones, Lecturer
DS 320	Computer Networks I	[C]	2nd / 4th	3/ 2	5	Panagiotis Demestichas, Associate Professor
DS 101	Algorithms and Complexity	[C]	2nd / 4th	3/ 2	5	Apostolos Meliones, Lecturer
DS 321	Computer Networks II	[C]	3rd / 5th	3/ 2	5	Panagiotis Demestichas, Associate Professor
DS 801	Security Policies and Security Management	[C]	3rd / 5th	3/ 2	5	Adjunct Lecturer
DS 505	Database Systems	[CC-ES]	3rd / 5th	3/ 2	5	George Vassilacopoulos, Professor Maria Halkidi, Lecturer
DS 511	Workflow Systems	[CC-ES]	3rd / 5th	3/ 2	5	Flora Malamateniou, Assistant Professor
DS 305	Digital Communications	[CC- CSN]	3rd / 5th	3/ 2	5	Georgios Efthymoglou, Assistant Professor
DS 013	Queuing Systems	[CC-CSN]	3rd / 5th	3/ 2	5	Panagiotis Demestichas, Associate Professor
DS 403	Computer Graphics and Virtual Reality	[OC-ES, OC-CSN]	3rd / 5th	3/ 2	5	Nikitas-Marinos Sgouros, Professor
DS 206	Compilers	[OC-ES, OC-CSN]	3rd / 5th	3/ 2	5	Nikitas-Marinos Sgouros, Professor
DS 708	Educational Psychology	[OC-ES]	3rd / 5th	3/ 2	5	Fotini Paraskeva, Assistant Professor
DS 701	Educational Digital Systems	[OC-ES]	3rd / 5th	3/ 2	5	Demetrios Sampson, Associate Professor
DS 516	Semantic Web - XML	[OC-ES]	3rd / 5th	3/ 2	5	Andriana Prentza, Assistant Professor
DS 302	Signals and Systems	[OC-CSN]	3rd / 5th	3/ 2	5	Georgios Efthymoglou, Assistant Professor

Code	Title	Type	Year of Study/ Semester	Theory/ Lab Sessions	ECTS Credits	Academic Personnel
DS 905	Management	[OC-ES, OC-CSN]	3rd / 5th	3/ 2	5	Department of Business Administration
DS 908	Marketing	[OC-ES, OC-CSN]	3rd / 5th	3/2	5	Department of Business Administration
DS 909	Technology and Innovation Management	[OC-ES, OC-CSN]	3rd / 5th	3/2	5	Department of Business Administration
DS 326	Internet Protocols	[C]	3rd / 6th	3/ 2	5	Vera-Alexandra Stavroulaki, Assistant Professor
DS 512	Information Systems	[C]	3rd / 6th	3/ 2	5	George Vassilacopoulos, Professor Marinos Themistocleous, Assistant Professor
DS 327	Network Services	[CC-ES]	3rd / 6th	3/ 2	5	Vera-Alexandra Stavroulaki, Assistant Professor
DS 506	Data Warehouses and Data Mining	[CC-ES]	3rd / 6th	3/ 2	5	Maria Halkidi, Lecturer
DS 304	Wireless Communications	[CC-CSN]	3rd / 6th	3/ 2	5	Athanasios Kanatas, Associate Professor
DS 803	Network Security	[CC-CSN]	3rd / 6th	3/ 2	5	Christos Xenakis, Lecturer
DS 306	Digital Signal Processing	[OC-ES, OC-CSN]	3rd / 6th	3/ 2	5	Georgios Efthymoglou, Assistant Professor
DS 707	Digital Media in Education	[OC-ES]	3rd / 6th	3/ 2	5	Demetrios Sampson, Associate Professor
DS 720	e-Health Services	[OC-ES]	3rd / 6th	3/ 2	5	Flora Malamateniou, Assistant Professor
DS 702	Didactics of Digital Technologies	[OC-ES]	3rd / 6th	3/ 2	5	Symeon Retalis, Associate Professor
DS 710	IT-Centric Professional Development	[OC-ES]	3rd / 6th	3/ 2	5	Fotini Paraskeva, Assistant Professor
DS 807	Privacy Enhancing Technologies	[OC-ES, OC-CSN]	3rd / 6th	3/ 2	5	Costas Lambrinoudakis, Assistant Professor
DS 401	Intelligent Systems	[OC-ES, OC-CSN]	3rd / 6th	3/ 2	5	Nikitas-Marinos Sgouros, Professor
DS 901	Operational Research	[OC-ES, OC-CSN]	3rd / 6th	3/ 2	5	Department of Business Administration
DS 202	Logic Design	[OC-ES]	3rd / 6th	3/ 2	5	Costas Lambrinoudakis, Assistant Professor
DS 904	Total Quality Management	[OC-ES, OC-CSN]	3rd / 6th	3/ 2	5	Department of Business Administration
DS 906	Final Year Project	[C]	4th / 7th o	3/ 2	5	Department's Academic Staff
DS 902	Project Management	[C]	4th / 7th	3/ 2	5	Flora Malamateniou, Assistant Professor
DS 703	e-Learning Systems	[CC-ES]	4th / 7th	3/ 2	5	Demetrios Sampson, Associate Professor
DS 513	Network Oriented Information Systems	[CC-ES]	4th / 7th	3/ 2	5	George Vassilacopoulos, Professor Marinos Themistocleous, Assistant Professor
DS 309	Broadband Networks	[CC-CSN]	4th / 7th	3/ 2	5	Angeliki Alexiou, Assistant Professor

Code	Title	Type	Year of Study/ Semester	Theory/ Lab Sessions	ECTS Credits	Academic Personnel
DS 303	Satellite Communications	[CC-CSN]	4th/ 7th	3/ 2	5	Athanasios Kanatas, Associate Professor
DS 705	Instructional Design of Adult Learning Programs	[OC-ES]	4th/ 7th	3/ 2	5	Symeon Retalis, Associate Professor
DS 514	e-Business	[OC-ES]	4th/ 7th	3/ 2	5	Marinos Themistocleous, Assistant Professor
DS 517	Web Applications Development	[OC-ES, OC-CSN]	4th/ 7th	3/ 2	5	Vera-Alexandra Stavroulaki, Assistant Professor
DS 806	Cryptography	[OC-ES, OC-CSN]	4th/ 7th	3/ 2	5	Christos Xenakis, Assistant Professor
DS 310	Wireless Sensor Networks	[OC-ES, OC-CSN]	4th/ 7th	3/ 2	5	Angeliki Alexiou, Assistant Professor
DS 324	Design and Optimization of Telecommunication Systems and Networks	[OC-CSN]	4th/ 7th	3/ 2	5	Angelos Rouskas, Assistant Professor
DS 311	Simulation of Telecommunication Systems and Networks	[OC-CSN]	4th/ 7th	3/ 2	5	Angelos Rouskas, Assistant Professor
DS 903	Human Resource Management	[OC-ES]	4th/ 7th	3/ 2	5	Department of Business Administration
DS 911	Entrepreneurship	[OC-ES, OC-CSN]	4th/ 7th	3/ 2	5	Department of Business Administration
DS 910	Business Policy and Strategic	[OC-ES, OC-CSN]	4th/ 7th	3/ 2	5	Department of Business Administration
DS 920	Professional Training Project	[OC-ES, OC-CSN]	4th/ 7th	3/ 2	5	Department's Academic Staff
DS 907	Final Year Project	[C]	4th/ 8th	3/ 2	5	Department's Academic Staff
DS 323	Mobile and Personal Communication Networks	[C]	4th/ 8th	3/ 2	5	Angelos Rouskas, Assistant Professor
DS 515	Information Systems Management	[CC-ES]	4th/ 8th	3/ 2	5	Marinos Themistocleous, Assistant Professor
DS 802	Information Systems Security	[CC-ES]	4th/ 8th	3/ 2	5	Adjunct Lecturer
DS 302	Mobile Communication Systems	[CC-CSN]	4th/ 8th	3/ 2	5	Athanasios Kanatas, Associate Professor
DS 322	Network Management	[CC-CSN]	4th/ 8th	3/ 2	5	Panagiotis Demestichas, Associate Professor
DS 704	Knowledge and Competence Management	[OC-ES]	4th/ 8th	3/ 2	5	Demetrios Sampson, Associate Professor
DS 709	Collaborative Learning Environments	[OC-ES]	4th/ 8th	3/ 2	5	Fotini Paraskeva, Assistant Professor
DS 804	Mobile and Wireless Communications Security	[OC-CSN]	4th/ 8th	3/ 2	5	Christos Xenakis, Assistant Professor
DS 312	Advanced Topics in Wireless Communications	[OC-CSN]	4th/ 8th	3/ 2	5	Angeliki Alexiou, Assistant Professor

Code	Title	Type	Year of Study/ Semester	Theory/ Lab Sessions	ECTS Credits	Academic Personnel
DS 325	Intelligent Networks	[OC-ES, OC-CSN]	4th/ 8th	3/ 2	5	Angelos Rouskas, Assistant Professor
DS 308	Performance Evaluation of Telecommunication Systems	[OC-CSN]	4th/ 8th	3/ 2	5	Georgios Efthymoglou, Assistant Professor
DS 721	Healthcare Information Systems	[OC-ES]	4th/ 8th	3/ 2	5	Flora Malamateniou, Assistant Professor
DS 203	Embedded Systems	[OC-ES, OC-CSN]	4th/ 8th	3/ 2	5	Apostolos Meliones, Lecturer
DS 920	Professional Training Project	[OC-ES, OC-CSN]	4th/ 8th	3/ 2	5	Department's Academic Staff

2.4.1 Undergraduate Programme Individual Course Description

1st Semester

Course Code:	DS 001
Course Title:	Mathematical Analysis I
Type of Course:	[C]
Year of Study/ Semester:	1st/ 1st
Theory/ Lab Sessions:	4 hours/ 0 hours
ECTS Credits:	4
Academic Personnel:	Adjunct Lecturer

Objective

This course attempts to extend the knowledge gained at the high school in the area of mathematics. In doing so, the course provides an appropriate mathematical background that supports the students to study the fields of computers and computer networks.

Prerequisites: -

Course Contents

Sets. Actions. Functions. Circular functions. Taylor's theory. Application of derivatives. Integrals. Defined integrals. Integrals techniques. Undefined integrals. Techniques and applications. Generalized integrals. Beta and gamma. 1st level differential equations. Sequences. Series. Dynamic-series.

Recommended Reading

1. Schroder, B. S. (2007): Mathematical Analysis: A Concise Introduction, Wiley-Interscience.

Course Code:	DS 010
Course Title:	Probability Theory
Type of Course:	[C]
Year of Study/ Semester:	1st/ 1st
Theory/ Lab Sessions:	4 hours/ 0 hours
ECTS Credits:	4
Academic Personnel:	Adjunct Lecturer

Objective

The aim of the course is to introduce the area of probability theory and explain the fundamental concepts.

Prerequisites: -

Course Contents

Accidental experiment, samples and possibilities. Definitions of possibilities. Finite samples with results of equal possibilities. Provisions. Combinations. Binomial theorem. Committed probability. The multiplicative theorem. Total probability and Bayes theorem. Independent trials. Random variables. Probability distributions. Parameters of distributions. Interrelation of distribution accidental variables. One-dimensional distributions. Continuous distributions. Generators of proneness. Probabilities generators.

Recommended Reading

1. Durrett, R. (2004): Probability: Theory and Examples (3rd Edition), Duxbury Press.

Course Code:	DS 003
Course Title:	Linear Algebra
Type of Course:	[C]
Year of Study/ Semester:	1st/ 1st
Theory/ Lab Sessions:	4 hours/ 0 hours
ECTS Credits:	4
Academic Personnel:	Adjunct Lecturer

Objective

The aim of the course is to present subjects from the area of Linear Algebra. The course introduces the students to fundamental algebraic structures of linear spaces of finite dimension, and calculus of tables. Particular attention is given to linear space of tables.

Prerequisites: -

Course Contents

Sets and sets' functions. Boolean algebra. Vectors spaces. sub-spaces. Linear independence. Base and dimension. Table functions. Linear spaces. Degree table. Fixing. Attributes fixing. Methods of calculation. Minor fixing and algebraic supplement. Calculation of reverse table. Linear systems. General solution. Cramer's method. Linear spaces. Cauchy-Schwartz inequality. Norm. Orthogonality. Orthogonal tables. Pythagorean

theorem. Gram-Schmidt method. Polynomial characteristic. Caley-Hamilton theorem. Applications (difference equations. Markov evolution). Singular value decomposition. Orthogonal and symmetrical tables.

Recommended Reading

1. Strang, G. (2005): Linear Algebra and Its Applications (4th Edition), Brooks Cole.

Course Code:	DS 501
Course Title:	C Programming
Type of Course:	[C]
Year of Study/ Semester:	1st/ 1st
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	V. A. Stavroulaki, Assistant Professor

Objective

The goal of this course is to introduce basic programming principles using the C programming language. C is a principal programming language and a fundamental component of C++ and Java. During the course the students become familiar with the concepts and principles of structured programming, and they gain the basic knowledge for the comprehension and easier learning of other programming languages in the sequel.

Prerequisites: -

Course Contents

Algorithms. Pseudo code. Concepts of programming languages. Main elements of a c program. Data types. Variables. Operands and expressions: types. Declarations and variable initialization. Type modifiers. Type casting. Flow control: if, if…else, for, while, do, etc. Use of logical and relational operands. Arrays and strings: use. Creation and management of single-dimension and multi-dimensional arrays. Use. Creation and management of strings. Pointers. Definition and initialization. Use of pointers. Functions: function prototypes. Recursive functions. Function arguments/parameters. Passing arguments to the main() function. Input/output functions. File management. Structures. Unions and enumerations.

Recommended Reading

1. Kernighan, B.W. & Ritchie, D. M. (1998): C Programming Language (2nd Edition), Prentice Hall.
2. Jones, B.L. & Aitken, P. (2002): Sams Teach Yourself C in 21 Days (6th Edition), Sams.

Course Code:	DS 201
Course Title:	Computer Architecture
Type of Course:	[C]
Year of Study/ Semester:	1st/ 1st
Theory/ Lab Sessions:	3 hours/ 2 hour
ECTS Credits:	5
Academic Personnel:	C. Lambrinoudakis, Assistant Professor

Objective

The main objective of the course is the familiarization of the students with the binary logic, the digital design methodologies and the basic architectural characteristics and structure of a computer system.

Prerequisites: -

Course Contents

Digital Systems History. Numerical Systems: Binary, Octal, Hexadecimal, conversions from one system to the other. Binary Arithmetic Operations, Use of Complements, Binary Codes. Logic Gates. Boolean Algebra. Truth Tables, Karnaugh Charts, Examples of Logic Circuits Design. Introduction to the Synchronous Sequential Circuits. Flip – Flops (D, T, RS and JK-type). Design of Counters, Registers and Shift Registers. Methodology for Designing and Analyzing Synchronous Sequential Circuits. Structure, Organization and Operation of Computer Systems, Von Neumann Architecture. Data Representation (Fixed and Floating Point formats), Instruction Sets. Organization and Operation of the Central Processing Unit. Control Unit. Memory Hierarchy, Memory Cell, Addressing Modes, Design of a Random Access Memory, Interconnecting the Memory and the Central Processing Unit. Virtual Memory. Paging and Segmentation. Cache Memory.

Recommended Reading

1. Mano, M. (2003): Digital Design, Pearson Education Limited.
2. Stallings, W. (2002): Computer Organization and Architecture, Pearson Education Limited.

Course Code:	DS 005
Course Title:	Mathematical Logic
Type of Course:	[C]
Year of Study/ Semester:	1st/ 1st
Theory/ Lab Sessions:	4 hours/ 0 hours
ECTS Credits:	4
Academic Personnel:	A. Meliones, Lecturer

Objective

To introduce the language and semantics of propositional and first order predicate logic. To introduce and demonstrate the natural deduction and tableaux proof systems.

Prerequisites: -

Course Contents

Propositional logic. Logical connectives; adequacy of connectives. Disjunctive and conjunctive normal forms. Validity. Satisfiability. Semantic entailment. First-order predicate logic: Syntax. Variables. Structures. Informal and formal semantics. Proof systems: natural deduction and tableaux for propositional and predicate logic.

Recommended Reading

1. Mendelson, E. (1997): Introduction to Mathematical Logic (4th Edition), Chapman & Hall.

Course Code:	DS 706
Course Title:	Instructional Methods
Type of Course:	[C]
Year of Study/ Semester:	1st/ 1st
Theory/ Lab Sessions:	3 hours/ 1 hour
ECTS Credits:	4
Academic Personnel:	F. Paraskeva, Assistant Professor

Objective

This course introduces students to fundamental educational theories. By doing so, it develops and evaluates educational models for students supported by digital systems and tools.

Prerequisites: -

Course Contents

Education - Learning - Instruction – Training. Learning, educational theories/models and instructional design. Taxonomies and learning objectives (design patterns, methods, learning strategies, techniques, activities, assessment and evaluation). Applications using ICT. Personal and psychological factors in learning and instruction.

Recommended Reading

1. Driscoll, M. P. (2004): Psychology of Learning for Instruction (3rd Edition), Prentice Hall.

2. Gredler, M. E. (2004): Learning and Instruction : Theory into Practice (5th Edition), Prentice Hall.

3. Gagne, R.M., Wager W.W., Golas, K. & Keller, J.M. (2004): Principles of Instructional Design, Wadsworth Pub Co.

2nd Semester

Course Code:	DS 002
Course Title:	Mathematical Analysis II
Type of Course:	[C]
Year of Study/ Semester:	1st/ 2nd
Theory/ Lab Sessions:	4 hours/ 0 hours
ECTS Credits:	4
Academic Personnel:	Adjunct Lecturer

Objective

This course attempts to enhance the knowledge gained in the course Mathematical Analysis I and to provide an appropriate mathematical background that enables the students to study the fields of computers and computers networks.

Prerequisites: DS 001 - Mathematical Analysis I.

Course Contents

Vectors in the level and in the space. Vector interrelations. Applications: laws of Kepler. Interrelations of multiple variables (definition, graphic representation, limits, constantly, certain derivative, derivative as for direction, total differential gear, very little - biggest). Precise differential equations. Double and triple integrals. Change of coordinates – applications. Laplace transformations. Fourier transformations. Completion of vector fields (bent - divergence – turn, curve integrals, surface integrals, theorems green, gauss, stokes).

Recommended Reading

1. Zygmund, A. (2003): Trigonometric Series (3rd Edition), Cambridge University Press.

Course Code:	DS 012
Course Title:	Stochastic Processes
Type of Course:	[C]
Year of Study/ Semester:	1st/ 2nd
Theory/ Lab Sessions:	4 hours/ 0 hours
ECTS Credits:	4
Academic Personnel:	A. Alexiou, Assistant Professor

Objective

This course provides an introduction to stochastic processes in communications, signal processing and digital and computer systems. Topics include continuous and discrete random processes, correlation and power spectral density, Markov chains, and queuing theory.

Prerequisites: -

Course Contents

Introduction: review of probability theory. Stochastic Processes. Types of stochastic processes. Mean and ergodicity. Gaussian stochastic processes: multi-variable stochastic processes. Independent, identically distributed random sequences. Discrete stochastic processes. Continuous stochastic processes. Poisson processes: theory and applications. Stationary processes. Transmission of a random process through a linear time-invariant filter. Power spectral density. Markov chains: introduction to Markov chains. Discrete-time Markov chains.

Recommended Reading

1. Papoulis, A., Unnikrishna, S. & Pillai (2002): Probability, Random Variables and Stochastic Processes, McGraw-Hill Education – Europe.
2. Yates, R. & Goodman, D. J. (2004): Probability and Stochastic Processes, John Wiley & Sons.

Course Code:	DS 004

Course Title:	Discrete Mathematics
Type of Course:	[C]
Year of Study/ Semester:	1st/ 2nd
Theory/ Lab Sessions:	4 hours/ 0 hours
ECTS Credits:	4
Academic Personnel:	Adjunct Lecturer

Objective

The aim is to present and analyse elements of Mathematical Logic that are important in computer science. In doing so, the course presents elements from the theories of graphs, trees, complexity and algorithms.

Prerequisites: -

Course Contents

Sets and proposals: finite. Countable and uncountable totals. Mathematic induction. Proposals. Combinational elements: changes. Combinations. Provisions. Calculable and typical languages: Rusell's paradox. Languages. Syntax types and languages. Retrospective relations and retrospective algorithms: linear relations. Homogenous. Special and total solutions. Not linear relations. Solutions with the method of generators of interrelations. Trees: trees with roots. Lengths of paths. Binary search trees. Graphs: multiple graphs and weighted graphs. Paths and cycles. Paths and cycles (Euler-Hamilton). Analysis of algorithms: time complexity.

Recommended Reading

1. Rosen, K.H. (2006): Discrete Mathematics and Its Applications (6th Edition), McGraw-Hill Science.

Course Code:	DS 204
Course Title:	Operating Systems I
Type of Course:	[C]
Year of Study/ Semester:	1st/ 2nd
Theory/ Lab Sessions:	3 hours/ 2 hour
ECTS Credits:	5
Academic Personnel:	C. Lambrinoudakis, Assistant Professor

Objective

The main objective of the course is the familiarization of the students with the fundamental concepts of an operating system. Furthermore, they will be presented with the main operating system design principles, the technical problems that they manage and how the distinct characteristics of each operating system may influence the overall system functionality.

Prerequisites: -

Course Contents

Fundamental Concepts and History of Operating Systems. Operating System Structure. Processes: Properties and Creation, Interprocess Communication and Process Scheduling. Use and Creation of Threads, Pop-Up Threads, Making Single-Threaded Code Multithreaded, Thread Scheduling. Deadlocks: The Ostrich Algorithm, Detection, Recovery, Avoidance, Prevention. Memory Management: Virtual Memory, Design and Implementation of the Paging Mechanism, Page Replacement Algorithms, Segmentation. Input/Output: Hardware and Software, Disks, Terminals. File System: Files and Directories, File System Implementation.

Recommended Reading

1. Silberschatz, A., Galvin, P.B. & Gagne, G. (2005): Operating System Concepts, John Wiley and Sons Ltd.
2. Tanenbaum, A. (2001): Modern Operating Systems (2nd Edition), Prentice Hall.

Course Code:	DS 502
Course Title:	Object-Oriented Programming
Type of Course:	[C]
Year of Study/ Semester:	1st/ 2nd
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Prentza, Assistant Professor

Objective

The aim of this course is the comprehension of the fundamentals of Object Oriented Programming (OOP), the familiarisation of students with an OOP language such as Java, the conceptual and practical comprehension of OOP approach with Java and the awareness of problems during the development of net-centric information systems using the OO Approach.

Prerequisites: DS 501 - C Programming.

Course Contents

Introduction to Object Oriented Technology. OOP and basic models. OOP with Java: introduction to Java, development of program applications in Java. Introduction to classes and objects/methods. Data types. Operators. Control statements. Java methods. Java API. Arrays in Java. Inheritance and polymorphism. Exception handling. Files and streams. Java Graphical User Interface (GUI). Introduction to Java applets. Threads and multithreading.

Recommended Reading

1. Deitel, H.M. & Deitel, P.J. (2007): Java How to program (7th Edition), Prentice Hall.
2. Savitch, W. & Carrano, F. (2008): Java: Introduction to problem solving and programming (5th Edition), Prentice Hall.

Course Code:	DS 508
Course Title:	Systems Analysis and Design
Type of Course:	[C]
Year of Study/ Semester:	1st/ 2nd
Theory/ Lab Sessions:	3 hours/ 1 hour
ECTS Credits:	4
Academic Personnel:	A. Prentza, Assistant Professor

Objective

The aim of this course is the understanding of the basic concepts of Systems analysis and design and the methodologies used for the development of Systems, the familiarization and application of graphical modelling languages with emphasis on Unified Modelling Language (UML) and the understanding of the concepts of object oriented analysis and design.

Prerequisites: DS 502 - Object-Oriented Programming.

Course Contents

Introduction to Systems analysis and design. Basic concepts of systems theory. Systemic approach. Systems structure, environment, methodology, models. Selecting systems theories. Object oriented approach. Graphical modelling techniques. Introduction to UML. Use of UML diagrams for systems analysis, design and development. UML tools. Use case models. UML diagrams (use case diagrams, class diagrams, object diagrams, sequence and communication diagrams, activity diagrams, state diagrams, component and deployment diagrams). Rational Unified Process (RUP).

Recommended Reading

1. Maciaszek, L.A. (2007): Requirements Analysis and Systems Design (3rd Edition), Addison Wesley.
2. Booch, G., Rumbaugh, J. & Jacobson, I. (2005): Unified Modeling Language User Guide (2nd Edition), Addison Wesley.

Course Code:	DS 011
Course Title:	Statistics
Type of Course:	[C]
Year of Study/ Semester:	1st/ 2nd
Theory/ Lab Sessions:	4 hours/ 0 hours
ECTS Credits:	4
Academic Personnel:	Adjunct Lecturer

Objective

The aim of this course is the understanding of the fundamental concepts of statistics.

Prerequisites: DS 010 - Probability Theory.

Course Contents

Sample theory, samples, replacement. Random samples and numbers. Sampling distributions and statistical interrelations. Frequency and relative frequency. Cluster sampling. Stratified sampling. Systematic sampling. Statistical estimations unbiased estimations. Reliability and confidence intervals. Hypotheses testing and importance of statistics hypotheses. Significance level. Normal distribution testing. Interpretation of criterion t for dependent and independent samples. Adaptation test x2. Adaptation curve. Regression and cross-correlation adaptation curve. Regression. Least square. Multiple regression. Estimation fault. Factors of cross-correlation. Correlation and independence. Interpretation of indicators of cross-correlation. Pearson. Spearman. Biserial. ϕ. Propagation analysis. Interpretation of propagation analysis. Multiple-variables statistical analysis.

Recommended Reading

1. McClave, J.T. & Sincich, T. (2006): Statistics (10th Edition), Prentice Hall.

3rd Semester

Course Code:	DS 205
Course Title:	Operating Systems II – UNIX
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 3rd
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	C. Lambrinoudakis, Assistant Professor

Objective

The course will highlight the special characteristics of operating systems for multiprocessors, multicomputers, distributed systems and multimedia systems. Furthermore, issues related to the security of an operating system will be presented. As a case-study, the course will end up with an overview of the UNIX operating system, the use and programming of the Bourne shell and the basic system administration principles.

Prerequisites: DS 204 – Operating Systems I.

Course Contents

Operating systems for Multiprocessors, Multicomputers, Distributed Systems. Multimedia Systems: Multimedia Files, Video Compression. Multimedia Process Scheduling. Operating Systems Security: Threats, Attacks, User Identification, Access Control Mechanisms. Operating Systems Design Principles. Operating Systems for Smart Cards: Multi-application – Single Service Provider, Multi-application – Multiple Service Providers, JAVA cards. UNIX History and Main Principles: The File System, The UNIX Shell, Supporting Programs, The Kernel Structure. UNIX Processes. UNIX Memory Management. UNIX Input – Output. The UNIX File System. Bourne Shell: Usage, Customization, Redirecting Input/Output. Shell Programming: Variables, Flow Control, Regular Expressions, Signals. System Administration, User and Group Administration, Disk and File System Administration, Software Installation.

Recommended Reading

1. Wrightson, K. & Merlino, J. (2000): Matering UNIX, Sybex.

2. Kernighan, B. W. & Pike, R. (1984): The Unix Programming Environment, Pearson Education Limited.

Course Code:	DS 301
Course Title:	Introduction to Telecommunications
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 3rd
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Kanatas, Associate Professor

Objective

The course seeks to introduce telecommunication systems by focusing on the technologies of the physical layer. It provides the basic principles of analysis and design of telecommunication systems and the necessary mathematical tools. Moreover, basic analogue and digital communication systems are presented. The students are introduced in the telecommunications fundamentals and the basic transmission principles.

Prerequisites: DS 001 – Mathematical Analysis I, DS 003 – Linear Algebra, DS 012 – Stochastic Processes.

Course Contents

Signals in telecommunications (signal types, basic signals, signal transformations). Systems in telecommunications (categories, linear time invariant systems, impulse response, convolution, cross and auto correlation). Geometrical signal representation (Hilbert space, signal space, bases, orthogonal signals, Gram-Schmidt ortho-normalization). Fourier series (periodic signals, real signals and trigonometric Fourier series representation, response of linear time invariant systems to periodic signals, Parseval theorem). Fourier transformation (real signals, periodic signals, energy and power spectral density). Filters (ideal filters and categories). Noise (white noise and AWGN model). Capacity (Nyquist and Shannon limits). Sampling theorem. Quantization, PCM, analogue modulation techniques (AM, FM).

Recommended Reading

1. Haykin, S. (2001): Communication Systems, 4th Edition, Wiley.

2. Proakis, J. G. & Salehi, M. (2005): Fundamentals of Communication Systems, Pearson Prentice Hall.

Course Code:	DS 503
Course Title:	Data Structures
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 3rd
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	M. Halkidi, Lecturer

Objective

The course aims to analyze the basic data structures and learn how the choice of data structures and algorithm design impacts the performance of programs. It studies specific data structures such as linear lists, stacks, queues, hash tables, binary trees, binary search trees, and graphs.

Prerequisites: DS 502 – Object-Oriented Programming.

Course Contents

Introduction to data types. Arrays. Algorithm analysis and performance evaluation. Stacks. Queues. Linked lists. Priority queues. Binary trees. Search trees. Hash tables. Graphs: definition and properties, graph algorithms.

Recommended Reading

1. Sahni, S. (2004): Data Structures, Algorithms, and Applications in Java, Silicon Press.
2. Goodrich, M. & Tamassia, R. (2003): Data Structures and Algorithms in Java, John Wiley & Sons.

Course Code:	DS 509
Course Title:	Human - Computer Interaction
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 3rd
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Symeon Retalis, Associate Professor

Objective

The course emphasizes learning and problem solving issues surrounding the design of interactive systems using computational systems. Students will gain knowledge in software usability, interactive multimedia applications design, interactive systems evaluation and acquire dexterities in the designing, development and evaluation of multimedia applications.

Prerequisites: -

Course Contents

Topics in human computer interaction. The human as a computer user. Cognitive models. Visual coding. Focus and memory. Knowledge representation and management. Models of the mind. User conceptual models. Interaction technologies. Input/output devices. Graphical environments. Direct manipulation. Collaborative systems. Virtual reality. Interactive systems design methods. User-centred design. Usability requirements. Task analysis. Dialogue and internet interfaces design. System design - hierarchical task analysis. Prototyping. Usability evaluation methods and techniques. Design patterns. Special purpose interactive systems. Computer-supported cooperative work. Voice communication. Assistive technologies.

Recommended Reading

1. Dix, A., Finlay, J., Abowd, G. & Beale, R. (2004). Human-Computer Interaction, Prentice Hall.
2. Sears, A. & Jacko, J.A. (2007). The Human-Computer Interaction Handbook, CRC Press.

Course Code:	DS 805
Course Title:	Information Theory
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 3rd
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	C. Xenakis, Assistant Professor

Objective

The aim of this course is to support the students in learning the principles, concepts and applications of Information Theory. Information theory is a discipline in applied mathematics involving the quantification of data with the goal of enabling as much data as possible to be reliably stored on a medium or communicated over a channel. The measure of information, known as information entropy, is usually expressed by the average number of bits needed for storage or communication.

Prerequisites: -

Course Contents

Concepts of entropy and information. Basic definitions of probabilities. Source coding. Channel capacity. Channel coding. The Shannon's theorem. Error correction codes and decoding methods.

Recommended Reading

1. Cover, T.M. & Thomas, J.A. (2006): Elements of Information Theory, 2nd Edition, Wiley.

2. MacKay, D.J.C. (2003): Information Theory, Inference, and Learning Algorithms, Cambridge University Press.

Course Code:	DS 507
Course Title:	Software Engineering
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 3rd
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Prentza, Assistant Professor

Objective

The aim of the course is the acquaintance of students with the scientific area of Software Engineering, the presentation of important process models of the software lifecycle, the familiarization with the basic methodologies, techniques and tools for the systematic analysis, design, development, testing, operation and maintenance of software solutions of good quality on time and within budget.

Prerequisites: -

Course Contents

Introduction to Software Engineering. Need and objectives. Software lifecycle process models. Requirements analysis and modeling: structured analysis approach, data flow diagrams, state diagrams, software needs document. Software design: architecture and detailed design, software plan description document. Software coding. Standards and good programming practices. Software testing: components and integration testing. Software cost estimation: estimation techniques, algorithmic cost modeling. Software quality.

Recommended Reading

1. Pressman, R.S. (2005): Software Engineering - A Practitioner's Approach, 6th Edition, McGraw-Hill.

2. Sommerville, I. (2007): Software Engineering, 8th Edition, Addison-Wesley.

4th Semester

Course Code:	DS 504
Course Title:	Database Systems Design
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 4th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	G. Vassilacopoulos, Professor
	M. Halkidi, Lecturer

Objective

This course introduces the students to the main concepts of Relational Database Systems. It focuses on issues regarding the database modeling, design and programming in SQL. It also provides an overview of the basic data storage structures and file organization techniques.

Prerequisites: DS 503 - Data Structures.

Course Contents

Introduction to Relational databases. Relational model: Relations, Attributes, Relational schema, Relational algebra (operations), Relational calculus. Normalization: Integrity constraints, Functional dependencies, Decomposition, Normal forms. Entity-Relationship Model: Basic concepts, Entity Sets, Relationship Sets. Design Issues: Keys, E-R Diagram, Design of an E-R Database Schema, Reduction of an E-R schema to tables. SQL: Basic structure, Set Operations, Aggregate Functions, Joins, Nested sub-queries, Views, Modification of the Database (insert, update, delete), Triggers. Database internal storage and data retrieval methods. Characteristics of various storage means. Data and file structures. Data access techniques such as indices, B+-trees, Hashing.

Recommended Reading

1. Ramakrishnan, R. & Gehrke, J. (2002): Database Management Systems (3rd Edition), McGraw Hill.

2. Elmasri & Navathe. (2007): Fundamentals of Database Systems (5th Edition), Addison-Wesley.

Course Code:	DS 510
Course Title:	Web Programming
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 4th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	S. Retalis, Associate Professor

Objective

This course addresses concepts and technologies concerning the development of internet systems and applications.

Prerequisites: -

Course Contents

The course introduces students to the principles and development techniques of static and dynamical internet systems. It includes: Web servers. Client and server-side programming. Development of internet applications using HTML, CSS, JavaScript. Development of internet applications interconnecting with data bases PHP and MySQL. Development of high-level internet application using Flash.

Recommended Reading

1. Ullman, L. (2003): PHP and MySQL for Dynamic Web Sites, Peachpit Press.
2. Brooks, D.R. (2007): An Introduction to HTML and JavaScript for Scientists and Engineers, Springer.

Course Code:	DS 402
Course Title:	Multimedia Technology
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 4th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	N.-M. Sgouros, Professor

Objective

The goal of this course is the description and analysis of the basic technologies in multimedia systems. The course focuses especially on methods for coding and processing of multimedia content.

Prerequisites: -

Course Contents

Definition and classification of multimedia technologies. Audio and visual perception. Audio processing. Image and video processing. Design and development of multimedia systems.

Recommended Reading

1. Steinmetz, R. & Nahrstedt, K. (2002): Multimedia Systems, X.media publishing.

2. Mandal M.Kr. (2002): Multimedia Signals and Systems, Springer.

Course Code:	DS 207
Course Title:	Distributed Systems
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 4th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Meliones, Lecturer

Objective

This course focuses on distributed systems and studies their: (a) theoretical background, (b) design and implementation, (c) components, (d) concepts and (e) approaches.

Prerequisites: DS 502 – Object-Oriented Programming.

Course Contents

Introduction. Concepts of distributed systems. Advantages and disadvantages. Hardware and software issues. Design. The client server model. Algorithms for distributed systems. Web services. Parallel and distributed systems.

Recommended Reading

1. Tanenbaum, A.S. & van Steen, M. (2002): Distributed Systems: Principles and Paradigms (1st Edition), Prentice Hall,.

2. Coulouris, G., Dollimore, J. & Kindberg, T. (2000): Distributed Systems: Concepts and Design (3rd Edition), Addison Wesley.

Course Code:	DS 320
Course Title:	Computer Networks I
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 4th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	P. Demestichas, Associate Professor

Objective

The aim of this course is to introduce computer networks, protocol hierarchies, and explain the network layer.

Prerequisites: DS 301 - Introduction to Telecommunications.

Course Contents

Introduction to networks, need for networks, categories of networks. Network elements and communication links; Protocols and protocol hierarchies/stacks, role of protocols. Functionality of network layer, switching, circuit switching. Packet switching, datagrams, virtual circuits. Routing, link state routing, Dijkstra algorithm, open shortest path first (OSPF), internal gateway protocol (IGP), distance vector routing, Bellman-Ford algorithm, border gateway protocol (BGP);external gateway protocol (EGP), multicast routing, spanning trees, minimum cost spanning trees, broadcast routing; congestion control. Students are asked to conduct small projects, related to the implementation of network level functionality and algorithms, through the use of C/C++ and/or Java.

Recommended Reading

1. Haykin, S. (1994): Communication systems, Wiley.

2. Tanenbaum, A. (2003): Computer Networks, Prentice Hall.

Course Code:	DS 101
Course Title:	Algorithms and Complexity
Type of Course:	[C]
Year of Study/ Semester:	2nd/ 4th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Meliones, Lecturer

Objective

This course attempts to familiarize the students with problem solving using algorithms and algorithmic analysis. Common software problems will be addressed and corresponding algorithms will be analysed. Students familiarize themselves with algorithms implementation in the C/C++ languages.

Prerequisites: -

Course Contents

Problems and algorithms. Designing and analyzing algorithms (requirements and restrictions). The problem of connectivity. Complexity. Notations and basic functions. Sequential and binary search. Elements and data structures in C. Sieve of Heratosthenes. Recursion (introduction, divide & conquer, dynamic programming). Sorting (abstract implementation, selection sort, insertion sort, bubble sort, quicksort). Strings (fundamental functions, searching in files).

Recommended Reading

1. Cormen, T.H., Leiserson, C.E., Rivest, R.L. & Stein, C. (2001): Introduction to Algorithms (2nd Edition), The MIT Press.

2. Sedgewick, R. (2002): Algorithms in C++: Fundamentals, Data Structures, Sorting, Searching and Graph Algorithms (3rd Edition), Addison Wesley.

5th Semester

Course Code:	DS 321
Course Title:	Computer Networks II
Type of Course:	[C]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	P. Demestichas, Associate Professor

Objective

The course attempts to analyse the functionality of the Data Link Layer (DLL), Medium Access Control (MAC) and Logical Link Control (LLC) layers.

Prerequisites: DS 320 - Computer Networks I.

Course Contents

Introduction to the functionality of the Data Link Layer (DLL). Medium Access Control (MAC) and Logical Link Control (LLC) layers. Error control. Error detection. Error correction. Retransmission techniques. Error detection techniques. Cyclic Redundancy Codes (CRC). Error correction techniques. Hamming techniques. Forward Error Correction (FEC). Retransmission techniques. Stop-and-Wait (S&W). Alternating Bit Protocol (ABP). Automatic Repeat Request (ARQ). Sliding window techniques. Go Back N (GBN). Soptional Repeat (SRP). MAC protocols. Aloha. Carrier Sense Multiple Access (CSMA). MAC protocols in Wireless LANs/MANs/PANs. IEEE 802.x standards. LLC protocols. 802.2 standard.

Recommended Reading

1. Walrand, J. (1997): Communication Networks, Prentice Hall.
2. Tanenbaum, A. (2003): Computer Networks, Prentice Hall.

Course Code:	DS 801
Course Title:	Security Policies and Security Management
Type of Course:	[C]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Adjunct Lecturer

Objective

The aim of the course is the acquaintance of students with the field of information security, the familiarization with its fundamental principles, the acquisition of knowledge and application competencies of techniques and methods for managing security.

Prerequisites: -

Course Contents

Introduction: the need for protecting information and a protection framework. Definitions and primary concepts. Information systems security approaches. Information systems risk analysis and management methodologies. Available methods. The CRAMM method. Case study. Information systems security policies. Business continuity. Development phases. Information systems auditing: basic concepts. Importance and character of audit. Audit mechanisms. Steps of the audit plan. Security assurance and security evaluation. Criteria structure. Evaluation systems. Protection of personal data: supra-national initiatives. International conventions. National legal framework. Personal data protection problems in the internet. Deontology codes: fundamental principles.

Recommended Reading

1. Peltier, T. (1999): Information Security, Policy and Procedures: a Practitioner's Reference, CRC Press LLC.
2. Pfleeger, C. (1997): Security in Computing, Prentice Hall.

Course Code:	DS 505
Course Title:	Database Systems
Type of Course:	[CC-ES]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	G. Vassilacopoulos, Professor
	M. Halkidi, Lecturer

Objective

The aim of this course is to introduce the students to the principles of the Database Management System (DBMS). It covers issues related to the query processing, query optimization, transaction management and database system recovery. It also presents the main concepts of object-orient databases and describes the object-relational data model.

Prerequisites: DS 504 – Database Systems Design.

Course Contents

Introduction to Database Management Systems: Presentation of the fundamental concepts of DBMS, applications of database systems. Methods for query processing and optimization. Transaction management: characteristics of a transaction management system. Control synchronization and integrity of the system, multi-user access to the same data. Object oriented databases: basic concepts of OOP and how they are used in the context of Object Oriented Data Model, object relational data models. Distributed databases: design, query processing and transaction management in distributed systems.

Recommended Reading

1. Ramakrishnan, R. & Gehrke, J. (2002): Database Management Systems (3rd Edition), McGraw Hill.

2. Elmasri & Navathe. (2007): Fundamentals of Database Systems (5th Edition), Addison-Wesley.

Course Code:	DS 511
Course Title:	Workflow Systems
Type of Course:	[CC-ES]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	F. Malamateniou, Assistant Professor

Objective

The main objective of the course is to introduce business processes and workflows, to describe and elaborate on related concepts such as business process modeling and reengineering, architectural designs and security of workflow systems, operation of workflow systems and Workflow Management Systems (WfMS).

Prerequisites: DS 507 - Software Engineering, DS 504 – Database Systems Design, DS 505 - Database Systems, DS 320 - Computer Networks I, DS 321 - Computer Networks II, DS 502 - Object-Oriented Programming.

Course Contents

Business Processes. Processes and Workflows. Dimensions of Workflow. User Support. Categories of Workflow. Workflow-based applications. Business Engineering. Workflow Terminology. Workflow Management Systems Basics. Workflow Management Systems Structure. Workflow Management Systems Architecture. Workflow Management Systems Standards. Workflow Reference Model. Process Concepts and Structure. Control Flow of Workflow Model & UML. Business processes with BPEL4WS. Workflow Patterns.

Recommended Reading

1. Leymann, F. & Roller, D. (2000): Production Workflow: Concepts and Techniques, Prentice Hall.

2. Van der Aalst, W.M.P. & Van Hee K.M. (2002): Workflow Management: Models, Methods and Systems, MIT Press.

Course Code:	DS 305
Course Title:	Digital Communications
Type of Course:	[CC-CSN]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	G. Efthymoglou, Assistant Professor

Objective

This course introduces the methods of digital modulations at baseband (MPAM) and passband (MFSK, MPSK, QAM). It also presents the detection theory of these signals using the method of matched filtering and evaluates their performance in channels with noise and fading.

Prerequisites: DS 301 – Introduction to Telecommunications.

Course Contents

Telecommunication budget analysis. Noise figure. Composite noise figure and noise temperature. Calculation of effective receiver temperature. Baseband transmission methods. Probability of error for matched filter detection in AWGN. Filters with zero ISI (Nyquist filters). Binary passband modulations: ASK, FSK, and PSK. M-ary signalling: M-FSK, M-PSK, and QAM. Demodulation techniques and symbol error probability in AWGN and fading channels. Spectral efficiency of digital modulations. Link Budget according to system specifications. Channel coding. Convolutional codes and Viterbi algorithm. Performance of convolutional codes in AWGN channel.

Recommended Reading

1. Proakis, J. & Salehi, M. (2001). Communication Systems Engineering, 2nd Edition, Prentice Hall.

2. Sklar, B. (2001): Digital Communications: Fundamentals and Applications, 2nd Edition, Prentice Hall.

Course Code:	DS 013
Course Title:	Queuing Systems
Type of Course:	[CC-CSN]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	P. Demestichas, Associate Professor

Objective

This course seeks to teach Markov chains, birth-death processes, queuing systems, and networks of queuing systems.

Prerequisites: DS 320 - Computer Networks I.

Course Contents

Structure of queuing systems. Arrival process. Queues. Service systems. Review of relevant probability laws. Probability density functions. Stochastic processes. Continuous time Markov chains. Discrete time Markov chains. Birth – death processes. M/M/1. M/M/κ. M/M/1/κ. M/M/κ/κ. M/G/1. G/G/1 Models. Networks of queuing systems. Kleinrock approximation. Jackson networks. Applications. Students are asked to conduct small projects with the use of C/C++ and/or Java related to queuing systems and the analytical evaluation of communication and computer systems.

Recommended Reading

1. Kleinrock, L. (1975): Queueing Systems, John Wiley & Sons.

2. Walrand, J. (1997): Communication Networks, Prentice Hall.

Course Code:	DS 403
Course Title:	Computer Graphics and Virtual Reality
Type of Course:	[OC-ES, CC-CSN]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	N.-M. Sgouros, Professor

Objective

This course seeks to describe and analyze basic methods for image synthesis in digital systems. Apart from the algorithmic description of relevant methods, the course emphasizes specific implementations of 3D graphic systems.

Prerequisites: -

Course Contents

Definition and types of computer graphics systems. Modeling (basic geometric shapes - coordinate systems - geometric transformations, perspective projection). Shading and lighting (color models, modeling of light sources, rendering methods). Programming environments for computer graphics.

Recommended Reading

1. Edward, A. (2008): Interactive Computer Graphics: A Top-Down Approach using OpenGL (5th Edition), Addison Wesley.

2. Watt, A. & Policarpo, F. (1998): The Computer Image, Addison Wesley.

Course Code:	DS 206
Course Title:	Compilers
Type of Course:	[OC-ES, CC-CSN]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	N.-M. Sgouros, Professor

Objective

The analysis of the basic design and implementation principles of programming languages. The description of the ways with which these principles are applied in modern programming languages.

Prerequisites: -

Course Contents

Introduction – Overview of Modern Programming Languages, Language Definition (Regular Expressions - Automata – Context-Free Grammars). Programming Language Structure (Variables, Types and Scoping, Control Flow and Evaluation of Expressions, Subroutines, Iterative and Recursive Processes, Memory Management and

Communication). The Compiling/Interpretation Process (Lectical Analysis, Syntactic Analysis, Code Production & Optimization, Linking).

Recommended Reading

1. Scott, M. L. (2005): Programming Language Pragmatics (2nd Edition), Morgan Kaufmann.

2. Aho, A.V., Lam, M.S., Sethi R. & Ullman, J.D. (2006): Compilers: Principles, Techniques and Tools (2nd Edition), Addison Wesley.

Course Code:	DS 708
Course Title:	Educational Psychology
Type of Course:	[OC-ES]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	F. Paraskeva, Assistant Professor

Objective

This course introduces students to basic learning theories as well as different conditions of learning environments. The aim of the course is the theoretical and applied aspects of learning theories based on digital system technologies. (digital learning environments & tools).

Prerequisites: DS 706 - Instructional Methods, DS 509 - Human - Computer Interaction.

Course Contents

Learning and Digital Systems (software tools, open learning environments, communication and collaborative tools). Behavioral approaches of learning to collaborative learning environments (communities of practices). Psychological Learning theories: i) Behavioral Learning Theories. ii) Social Cognitive Learning theories (self-efficacy & self-regulation). iii) Cognitive Learning theories and tools. iv) Social Constructivism: Vygotsky's Theory (open-ended learning environments). Critical approaches of learning theories based on digital learning environments. Applications in different conditions of schooling (primary-secondary), tertiary educational programs. Life long learning programs for professional development and job training (marketing, sales, advertising, health).

Recommended Reading

1. Biehler, R.F. & Snowman J. (2006): Psychology applied to teaching, Houghton Mifflin.

2. Slavin, R. (2007): Educational Psychology, Allyn & Bacon.

Course Code:	DS 701
Course Title:	Educational Digital Systems
Type of Course:	[OC-ES]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	D. Sampson, Associate Professor

Objective

The goal of this course is to get students acquainted with the principles and techniques of Technology-enhanced Teaching and Learning within the framework of School Education and to help them develop a set of critical skills that will enable them to design and develop Technology-enhanced Teaching and Learning Strategies and Activities.

Prerequisites: DS 706 - Instructional Methods.

Course Contents

Technology-enhanced Learning (Theoretical Foundations, Basic Principles, a Teaching and Learning Framework for integrating Technology in School Education). Classification of Educational Digital Systems (Tutorials, Drill and Practice, Tests and Assessments, Problem Solving and Simulations, Modeling and Digital Games, Exploratory and Guided Discovery, Microworlds). Issues on Educational Design in Technology-enhanced Teaching and Learning. Best Practice Examples in Primary and Secondary School Education.

Recommended Reading

1. Smaldino, S.E., Russell, J.D., Heinich R.,et al., (2004): Instructional Technology and Media for Learning, 8th Edition, Prentice Hall.

2. Jonassen, D.H., Howland, J., Moore, J. & Marra, R.M. (2003): Learning to Solve Problems with Technology: A Constructivist Perspective, 2nd Edition, Prentice Hall.

Course Code:	DS 516
Course Title:	Semantic Web – XML
Type of Course:	[OC-ES]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Prentza, Assistant Professor

Objective

The aim of the course is the introduction to Semantic Web and exploration of means for semantic information management, familiarization with semantic web languages and related technologies with focus on XML, RDF and OWL and presentation of tools for the creation and processing of ontologies.

Prerequisites: DS 510 - Web Programming.

Course Contents

Introduction to Semantic Web. XML, DTDs, XML Schemas, accessing and querying XML documents, XSLT. RDF, RDF Schemas. Role of ontologies. Ontologies terminology. Web ontology languages (OWL). Ontology engineering. Tools and methods. Ontology management. Tools and frameworks. Ontology management. Ontologies and applications.

Recommended Reading

1. Antoniou, G. & van Harmelen, F. (2004): A semantic Web primer, MIT Press.

2. Davies, J., Fensel, D. & van Harmelen, F. (2003): Towards the Semantic Web: Ontology-Driven Knowledge Management, John Wiley.

Course Code:	DS 307
Course Title:	Signals and Systems
Type of Course:	[OC-CSN]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	G. Efthymoglou, Assistant Professor

Objective

This course is an introduction to the analysis and design of analogue and digital linear systems. The material covers the theoretical tools for the analysis of signals and systems in the time and frequency domains.

Prerequisites: DS 301 – Introduction to Telecommunications.

Course Contents

Spectrum of continuous energy signals. Power spectral density of periodic signals. Parseval's theorem. Laplace transform and inverse Laplace transform. Transfer function of linear analogue systems, bode plots. Impulse response and analogue convolution. Sampling theorem. Spectrum of sampled signals. Difference equations. Discrete time convolution. Z transform. Frequency response of discrete time signals and systems. Inverse-Z transform. Stability of linear systems. Design and analysis of a complete system. Signal quantization and quantization noise. Line coding and signal spectrum. Matched filtering. Discrete Fourier Transform (DFT), Inverse DFT. Circular convolution. Linear convolution using DFT. Spectral analysis using DFT. Orthogonal Frequency Division Modulation(OFDM) transmission and reception. Fading channel weight estimation using pilot symbols inside an OFDM symbol. OFDM performance in a channel with fading and noise.

Recommended Reading

1. Mulgrew, B., Grant, P. & Thomson, J. (2003): Digital Signal Processing Concepts and Applications, 2nd Edition, Palgrave Mackmillan.

2. Proakis, J. & Manolakis, D. (2007): Digital Signal Processing: Principles, Algorithms and Applications, 4th Edition Prentice Hall.

Course Code:	DS 905
Course Title:	Management
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Academic staff, Department of Business Administration

This course offered by the Department of *Business Administration* of University of Piraeus.

Course Code:	DS 908
Course Title:	Marketing
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Academic staff,, Department of Business Administration

This course offered by the Department of *Business Administration* of University of Piraeus.

Course Code:	DS 909
Course Title:	Technology and Innovation Management
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	3rd/ 5th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Academic staff, Department of Business Administration

This course offered by the Department of *Business Administration* of University of Piraeus.

6th Semester

Course Code:	DS 326
Course Title:	Internet Protocols
Type of Course:	[C]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	V.-A. Stavroulaki, Assistant Professor

Objective

The focus of this course is on the architectures and protocols of the first three layers that are used by Internet. The course presents theoretical aspects of the above topics, as well as exercises and programming issues on network services.

Prerequisites: DS 321 - Computer Networks II.

Course Contents

Introduction to the Internet, Main concepts, Terminology, Protocols, Applications. Internet architectures: Protocol hierarchies, Access networks, Autonomous systems, Core networks, Internet Service Providers (ISPs). Protocols: PPP (Point to Point Protocol), Role in the access and core networks, Functions, Packet format, IP (Internet Protocol), Functions, Packet format IPv4, IPv6, Segmentation, Addressing. Internet routing: Routing protocols, IGP (Internal Gateway Protocol), OSPF (Open Shortest Path First), BGP (Border Gateway Protocol), RIP (Routing Internet Protocol), ARP (Address Resolution Protocol). Quality of Service. QoS: Differentiated Services (DiffServ), Integrated Services (IntServ), MPLS (Multi; Protocol Label Switching). Mobile IP: main concepts, Addressing.

Recommended Reading

1. Forouzan, B.A. (2005): TCP/IP Protocol Suite, McGraw-Hill, 3rd Edition.
2. Tanenbaum, A.S. (2002): Computer Networks (4th Edition), Prentice Hall.

Course Code:	DS 512
Course Title:	Information Systems
Type of Course:	[C]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	G. Vassilacopoulos, Professor
	M. Themistocleous, Assistant Professor

Objective

This course analyses the five components of an Information System, the different types of IS and issues associated with the implementation and application of information systems.

Prerequisites: DS 505 – Database Systems.

Course Contents

Information system (IS). Component hardware. Component software. Component data. Component processes. Component human actors. Information systems lifecycles. Types of IS. Critical path analysis. Business process analysis. IDEF0 IDEF3. DFD. Business process reengineering. Business process improvement. Factors influencing IS implementation. The impact of information systems on organization. Practical examples of IS. Case studies. IS implementation.

Recommended Reading

1. Stair, R. & Reynolds, G. (2007): Fundamentals of Information Systems, 4th Edition, Thomson Publications.

2. O'Brien, J. (2005): Introduction to Information Systems, McGraw Hill.

Course Code:	DS 327
Course Title:	Network Services
Type of Course:	[CC-ES]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	V.-A. Stavroulaki, Assistant Professor

Objective

This course deals with the application and transport layers of the Internet protocol stack and it seeks to present operations and protocols for the support of network services and applications in these two levels.

Prerequisites: DS 321 - Computer Networks II, DS 501 - C Programming, DS 502 - Object-Oriented Programming.

Course Contents

Introduction to the transport and application layers: Concepts, Operations, Protocols, Client- server model. Quality of Service – QoS. Transport layer: Operations. Transmission Control Protocol (TCP). User Datagram Protocol (UDP). Application Programming Interfaces (APIs): Client-server model. TCP and UDP Socket programming. Application layer: Application layer protocols. Hypertext Transfer Protocol (HTTP). File Transfer Protocol (FTP). Simple Mail Transfer Protocol (SMTP). POP. IMAP. Real time applications and the Internet: Protocol SIP (Session Initiation Protocol). Protocol RTP (Real-Time Protocol). IMS platform (IP Multimedia System). VoIP (Voice over IP). VoD (Video on Demand) applications.

Recommended Reading

1. Forouzan, B. A. (2005): TCP/IP Protocol Suite (3rd Edition), McGraw-Hill.

2. Tanenbaum, A.S. (2002): Computer Networks (4th Edition), Prentice Hall.

Course Code:	DS 506
Course Title:	Data Warehouses and Data Mining
Type of Course:	[CC-ES]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	M. Halkidi, Lecturer

Objective

In this course we explore the main concepts of the Knowledge and Mining Process while we also discuss main data mining methods. Furthermore, the main techniques regarding the design and development of data warehouses are presented.

Prerequisites: DS 505 – Database Systems, DS 516 – Semantic Web - XML.

Course Contents

Introduction to the main data mining concepts and techniques. The main steps of knowledge and data discovery. Requirements of developing data mining approaches. Data pre-processing: data cleaning, transformation, dimensionality reduction. Data warehouses: multidimensional models, architecture, implementation of data warehouses, OLAP servers (ROLAP, MOLAP, HOLAP). Clustering: partitional, hierarchical, density-based, grid-based, spectral clustering, clustering applications; Classification: Bayesian classifiers, decision trees, neural networks, k-nearest neighbours; Association rules: Apriori, representative association rules; Quality assessment in data mining: evaluation of classification models, association rules interestingness measures, cluster validity; Web mining: link analysis, text mining, web search, page ranking algorithms.

Recommended Reading

1. Han, J. & Kamber, M. (2006): Data Mining: Concepts and Techniques (2nd Edition), Morgan Kaufmann.

2. Chakrabarti, S. (2002): Mining the Web, Discovering Knowledge from Hypertext Data, Morgan Kaufman Publishers.

Course Code:	DS 304
Course Title:	Wireless Communications
Type of Course:	[CC-CSN]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Kanatas, Associate Professor

Objective

The aim of the course is to enable students to understand the basic principles of electromagnetic systems for wireless communications. Using antennas as the interface of telecommunication systems with the transmission media, the course covers the characteristics and parameters of radiating systems and the electromagnetic waves they produce.

Prerequisites: DS 002 – Mathematical Analysis II, DS 301 – Introduction to Telecommunications.

Course Contents

Fundamentals on circuit theory (sinus steady state, phasors, characteristic impedance, complex power). Electromagnetic fields (electric field, displacement density, Gauss law, potential, potential lines, equipotential surfaces, divergence theorem, Poisson and Laplace equations, magnetic induction, magnetic flux density, magnetic field strength, ampere law for current elements, magnetic vector potential). Maxwell's equations.

Electromagnetic waves in free space (sinusoidal time variation, wave equation, plane waves, transversal e/m waves, standing waves, energy and power of waves, linear, circular and elliptical polarization). Point sources and e/m waves. Antenna radiation regions. Field and power antenna patterns. Basic antenna parameters (gain, directive gain, directivity, etc.). Antenna equivalent circuits (transmission and reception). Aperture antennas. Antenna polarization and loss factor. Transition from spherical to plane waves. A generic methodology for the calculation of radiated fields. Far field approximations. Basic antenna examples (hertz dipole, longer dipoles, λ/2 dipole, small loops, etc.). Basic wireless propagation equations (Friis' equation, reflection, scattering, diffraction).

Recommended Reading

1. Kraus, J. (1998). Electromagnetics, McGraw-Hill.
2. Balanis, C. (2005): Antenna Theory: Analysis and Design, 3rd Edition, Wiley.

Course Code:	DS 803
Course Title:	Network Security
Type of Course:	[CC-CSN]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	C. Xenakis, Assistant Professor

Objective

The aim of this course is to present and analyze the provisions made in an underlying computer network infrastructure, policies adopted by the network administrator to protect the network and the network-accessible resources from unauthorized access and the effectiveness (or lack) of these measures combined together. This course focuses on the security solutions, which are mainly employed in wired networks that use the Internet technology. It presents and analyses the security mechanisms and protocols that protect the network operation and users data.

Prerequisites: -

Course Contents

Security at lower layers. Network layer security solutions. Application layer security solutions. Key management protocols. Identity management protocols. Firewalls. Trust management. Distributed authentication systems and intrusion detection systems.

Recommended Reading

1. Stallings, W. (2007): Network Security Essentials, Applications and Standards, 3rd Edition, Prentice Hall.
2. Kaufman, C., Perlman, R. & Speciner, M. (2002): Network Security: Private Communication in a Public World, 2nd Edition, Prentice Hall.

Course Code:	DS 306
Course Title:	Digital Signal Processing
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	G. Efthymoglou, Assistant Professor

Objective

The students will be able to use the theory of linear systems to design analogue and digital filters according to design specifications.

Prerequisites: DS 307 – Signals and Systems.

Course Contents

Discrete time convolution. Z transform. Frequency response of discrete time signals and systems. Prototypes of analogue lowpass filters: Butterworth polynomials and Chebyshev polynomials. Frequency translation of normalized analogue filters. General algorithm for creating arbitrary analogue filters. Bilinear transformation. Design of digital infinite impulse response (IIR) filters using bilinear transformation. Frequency transformation of digital filters. Digital finite impulse response (FIR) filters with linear phase. FIR filter design using frequency sampling. Implementation issues and techniques for IIR and FIR filters.

Recommended Reading

1. Proakis, J. & Manolakis, D. (2007): Digital Signal Processing: Principles, Algorithms and Applications, 4th Edition, Prentice Hall.
2. Ingle, V. & Proakis, J. (2000): Digital Signal Processing Using Matlab, Brooks/Cole Publishing.

Course Code:	DS 707
Course Title:	Digital Media in Education
Type of Course:	[OC-ES]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	D. Sampson, Associate Professor

Objective

The goal of this course is to get students acquainted with the principles and techniques of using digital media to support web-based education and to help them develop a set of critical skills and competencies that will enable them to design and develop of Educational e-Content in general and in particular, Digital Learning Resources for System Users' Training (Experts or not) and Task Performance Improvement.

Prerequisites: DS 706 - Instructional Methods, DS 701 - Educational Digital Systems, DS 708 - Educational Psychology, DS 509 - Human - Computer Interaction, DS 510 - Web Programming.

Course Contents

Part A – Digital Media and Web Applications: Introduction to Digital Media. History. Information Architecture in Hypermedia Systems. Hypermedia Models. Web Applications. *Part B – Educational Use of Digital Media:* Factors that affect the use of Digital Media for Educational Purposes. Digital Media Characteristics: Technical, Functional based on the type of content (Decorative, Representational, Mnemonic, Organizational, Relational, Transformational, Interpretive). Functional based on the type of the Learning Activity. Learners' Characteristics. Learning Activity Characteristics. Examples of Educational Hypermedia.

Recommended Reading

1. Rosenfeld, L. & Morville, P. (2002): Information Architecture for the World Wide Web (2nd Edition). O'Reilly & Associates.

2. Clark, R., Nguyen F. & Sweller, J. (2006): Efficiency in Learning -Evidence-based Guidelines to manage Cognitive Load, Pfeiffer.

Course Code:	DS 720
Course Title:	e-Health Services
Type of Course:	[OC-ES]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	F. Malamateniou, Assistant Professor

Objective

The main objective of the course is to present the need for e-Health Services and the Information and Communication Technologies (ICTs) involved in the development of e-Health Services, to introduce Health Informatics basic concepts and to present state of play and action plan for e-Health Services, at national and international level.

Prerequisites: DS 512 - Information Systems, DS 511 - Workflow Systems, DS 507 - Software Engineering, DS 504 – Database Systems Design, DS 505 - Database Systems, DS 320 - Computer Networks I, DS 321 - Computer Networks II, DS 502 - Object-Oriented Programming.

Course Contents

Introduction to e-Health Services. Healthcare Organizations. Introduction to Healthcare Information Systems. Internet and Healthcare Delivery, Medical Coding and Standards. Pervasive & Ubiquitous Computing in Healthcare. e-Health Systems Development Methodologies. Ethics, Security and Protection of Healthcare Information Systems.

Recommended Reading

1. Tan, J. (2005): E-Health Care Information Systems: An Introduction for Students and Professionals, Wiley.

2. Bardram, J., Mihailidis, A. &Wan, D. (2006): Pervasive Computing in Healthcare, CRC.

Course Code:	DS 702
Course Title:	Didactics of Digital Technologies
Type of Course:	[OC-ES]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	S. Retalis, Associate Professor

Objective

The aim of this course is to help learners acquire knowledge on curricula, recommendations and teaching strategies that can be applied to computer science courses at primary, secondary and higher education. It focuses on strategies for analysis, design, implementation and evaluation of lesson plans in programming courses.

Prerequisites: -

Course Contents

Demanding tuitional concepts concerning computer science courses, teaching guidelines about digital literacy, curricula and teaching recommendations for computer science courses at primary, secondary educational level. Educational tools like Jeroo, KarelRobot, Alice, Scrach. Design and development of educational games.

Recommended Reading

1. UNESCO & IFIP (2002): Information and Communication Technology in Secondary Education – A Curriculum for Schools, Edited by Tom van Weert. Paris: UNESCO, 2002.

2. Bennedsen, J., Caspersen, M.E. & Kölling, M. (2008): Reflections on the Teaching of Programming Methods and Implementations, Series: Lecture Notes in Computer Science, Vol. 4821.

Course Code:	DS 710
Course Title:	IT-Centric Professional Development
Type of Course:	[OC-ES]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	F. Paraskeva, Assistant Professor

Objective

This course introduces students in consulting procedures for the personal and professional development in an IT context.

Prerequisites: DS 509 - Human - Computer Interaction, DS 701 - Educational Digital Systems, DS 708 - Educational Psychology.

Course Contents

Introduce students in basic principles of professional development in an IT environment: (Self)Management, Communication and Performance Skills (management skills, customer relations, communication skills through collaboration, developing trainee/employee/workers performance, personal performance skills, critical thinking and creative problem solving, making better decisions, training methods).

Recommended Reading

1. Robinson, D. & Robinson, J. (2008): Performance Consulting: A practical Guide for HR and Learning Professionals, Berrett-Koehler Publishers.

2. Rosenberg, M. (2001): E-Learning Strategies for Delivering Knowledge in the Digital Age, McGraw-Hill.

Course Code:	DS 807
Course Title:	Privacy Enhancing Technologies
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	C. Lambrinoudakis, Assistant Professor

Objective

The aim of the course is to raise the privacy issues related to the personal or/and sensitive data exchanged, by various electronic services, over open public networks, like the internet. The currently available privacy enhancing technologies will be presented, highlighting the privacy problems that specific application domains are facing as well as the appropriate mechanisms for each case.

Prerequisites: DS 801 **-** Security Policies and Security Management.

Course Contents

Privacy Definitions, Legal Framework for the Protection of Personal Data, Attacks against Privacy, Subjectiveness on Evaluating the Impact of a Privacy Violation Incident. The Requirements of Anonymity, Unlinkability, Undetectability and Unobservability. Relations between these Requirements. Pseudo-Anonymity. Identity Management. Privacy Enhancing Technologies. Privacy Enhancing Technologies for Sensor Networks and Ubiquitous Environments (RFIDs, Location Monitoring etc). Privacy Issues in VoIP Telephony. Privacy Protection in Health Information Systems.

Recommended Reading

1. Acquisti, A., Gritzalis, S., Lambrinoudakis, C. & De Capitani di Vimercati, S. (2008): Digital Privacy, Theory Technologies and Practices, Auerbach Publications.

2. Fisher-Huebner, S. (2001): IT Security and Privacy, Design and Use of Privacy Enhancing Security Mechanisms, LNCS 1958, Springer.

Course Code:	DS 401
Course Title:	Intelligent Systems
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	N.-M. Sgouros, Professor

Objective

The course seeks to introduce the students to the basic features of intelligent systems and their implementations. It focuses on symbolic knowledge representation and inference methods.

Prerequisites: -

Course Contents

Definitions and features of intelligent systems. Knowledge representation models. Inference techniques. Programming environments. PROLOG.

Recommended Reading

1. Luger, G. (2009): Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Addison Wesley.

2. Russell, S. & Norvig, P. (2002): Artificial Intelligence: A Modern Approach (2nd Edition), Prentice Hall.

Course Code:	DS 901
Course Title:	Operations Research
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Academic staff, Department of Business Administration

This course offered by the Department of *Business Administration* of University of Piraeus.

Objective

This course aims to teach optimization methods so that students are able to solve problems that are typically encountered in the field of modern technological systems such as networks and telecommunications.

Prerequisites: -

Course Contents

Linear programming; the Simplex method and variants that are computational efficient(such as the big M method); duality and sensitivity analysis; integer programming; transportation, transhipment and assignment problems; network optimization applications including shortest-route, minimal spanning tree and maximal flow;

introduction to heuristic algorithms; multiple criteria analysis; nonlinear programming; overview of dynamic programming; decision analysis.

Recommended Reading

1. Hillier, F.S. & Lieberman, G.J. (2005): Introduction to Operations Research (8th Edition), McGraw-Hill Science.

Course Code:	DS 202
Course Title:	Logic Design
Type of Course:	[OC-ES]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	C. Lambrinoudakis, Assistant Professor

Objective

Initially the methodology for designing complex logic circuits will be presented, together with the way these circuits are utilized for designing memory, cache memory or/and memory address decoding mechanisms. Following that, the characteristics of programmable control units will be addressed. Finally, the students will get familiarized with the advantages and peculiarities or parallel processing as well as performance evaluation issues.

Prerequisites: DS 201 – Computer Architecture.

Course Contents

Min- and Max-Term Functions, Regular Representation. Complex Logic Circuits (Adders– Comparators – Multiplexers– Decoders). Memory Design and Organization – Cache memory Organization – Virtual Memory. Programmable Control Units. Error Detection Codes (Hamming). Computer Systems' Performance. Assembly Language. Architectures for Parallel Processing.

Recommended Reading

1. Patterson D. & Hennessy J. (2009): Computer Organization and Design: The Hardware/Software Interface, Morgan Kaufmann.
2. Mano, M. (2003): Digital Design, Pearson Education Limited.
3. Stallings, W. (2002): Computer Organization and Architecture, Pearson Education Limited.

Course Code:	DS 904
Course Title:	Total Quality Management
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	3rd/ 6th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Academic staff, Department of Business Administration

This course offered by Department of *Business Administration* of University of Piraeus.

7th Semester

Course Code:	DS 902
Course Title:	Project Management
Type of Course:	[C]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	F. Malamateniou, Assistant Professor

Objective

The main objective of the course is to introduce project management basic concepts and, in particular, management of Information and Communications Technology (ICT) projects, to study a widely accepted methodological framework of project management and to use it in the management of ICT projects. In addition, project management tools will be presented and used for students' laboratory exercise.

Prerequisites: -

Course Contents

The Project Management Framework. Project Life-cycle and Organization. The Standard for Project Management of a Project. The Project Management Knowledge Areas (Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, Project Procurement Management). Management of ICT projects.

Recommended Reading

1. Project Management Institute (2004): A Guide to the Project Management Body of Knowledge, 3rd Edition (PMBOK Guides), Project Management Institute.
2. Nicholas, J. (2004): Project Management for Business and Engineering: Principles and Practice, Elsevier.

Course Code:	DS 703
Course Title:	e-Learning Systems
Type of Course:	[CC-ES]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	D. Sampson, Associate Professor

Objective

The goal of this course is to get students acquainted with the principles and techniques of web-based education and e-learning systems and to help them develop a set of critical skills and competencies that will enable them to design and develop e-Learning systems and courses.

Prerequisites: DS 706 - Instructional Methods, DS 701 - Educational Digital Systems, DS 510 - Web Programming, DS 707 – Digital Media in Education, DS 516 – Semantic Web - XML.

Course Contents

Web-based Education (definitions; history; advantages/disadvantages; typical examples of web-based education); A Conceptual Framework of Web-based Education; Tools for authoring and managing e-Learning Content (Case Study: Lectora); Tools for authoring and managing e-Learning Activities (Case Study: LAMS); e-Course Management Systems (Case Study: Moodle); Planning and Evaluating Web-based Educational Programmes; Quality Issues in Web-based Education.

Recommended Reading

1. Horton, W. (2006): E-Learning by Design, Pfeiffer Wiley.
2. Horton, W. & Horton, K. (2003): E-Learning Tools and Technologies, Wiley Publishing.

Course Code:	DS 513
Course Title:	Network Oriented Information Systems
Type of Course:	[CC-ES]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	G. Vassilacopoulos, Professor
	M. Themistocleous, Assistant Professor

Objective

The aim of this course is the understanding of the nature of the Information Systems that are run and managed over a network.

Prerequisites: DS 512 – Information Systems, ΨΣ 516 – Semantic Web - XML.

Course Contents

Information Systems and Networks. Portals. Middleware. Integration. Enterprise Application Integration. Enterprise Service Bus. Web Services. Service Oriented Architectures. SOA Governance. Organizational Change. The impact of Integrated net centric IS on organizations. Enterprise Resource Planning applications. Customer Relationship Management systems. Supply Chain Management solutions. e-business applications.

Recommended Reading

1. Papazoglou, M. P. (2008): Web Services: Principles and Technology, Pearson, Pentice Hall.

2. Josuttis, N. (2007): SOA in Practice, O'Reilly.

Course Code:	DS 309
Course Title:	Broadband Networks
Type of Course:	[CC-CSN]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Alexiou, Assistant Professor

Objective

The aim of this course is to provide an introduction to broadband technologies and their applications and familiarize students with broadband networks and relevant protocols.

Prerequisites: DS 326 - Internet Protocols.

Course Contents

Introduction to broadband networks. Main concepts. Integrated services networks. Access networks. Core networks. Integrated services networks: integrated services digital networks (ISDN).   Broadband   integrated services digital networks (B-ISDN). Access networks/technologies: public switched telephone networks (PSTN). digital subscriber line (DSL). Wireless-access (broadcasting, mobile, fixed-wireless access–FWA). fiber to the curb/home (FTTX). Core networks/technologies: ATM. Ethernet. Ethernet wide area networks. Optical technologies. Synchronous optical networks (SONET). Wave division multiplexing (WDM). Passive optical networks (PONs). Wireless broadband technologies: WI-FI. Wimax. 3G (Long Term Evolution). Satellite.

Recommended Reading

1. Russell, T. (1997): Telecommunication Protocols (McGraw-Hill Education).

2. Cajetan M. Akujuobi, Matthew N.O. Sadiku, (1997): Introduction to Broadband Communication Systems, Chapman & Hall/CRC.

Course Code:	DS 303
Course Title:	Satellite Communications
Type of Course:	[CC-CSN]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Kanatas, Associate Professor

Objective

This course requires a well developed background on telecommunication systems, digital techniques and wireless links are required. In this course, Satellite links for diverse services are studied with an emphasis on performance evaluation and link availability.

Prerequisites: DS 320 – Computer Networks I, DS 305 – Digital Communications, DS 304 – Wireless Communications, DS 307 – Signals and Systems.

Course Contents

Satellite communication systems (characteristics, services, earth stations, organizations and standardization bodies). Orbit mechanics (Keplerian orbits, motion equations, orbit parameters, earth orbit, earth-satellite relative geometry, GEO, LEO, MEO, HEO satellites). Analysis and design of satellite communication links (antenna characteristic parameters, link budget for clear sky conditions and for rain conditions, noise effects, quality measures and figures of merit for satellite receivers, the transmission path, signal to noise ratio for an earth station to earth station link, satellite amplifiers and transfer characteristics, saturation and power gain at the satellite). Transmission techniques analysis (analogue and digital baseband transmission techniques and modulation for audio and video signals). Multiple access techniques (FDMA, TDMA, CDMA) for satellite networks. Single and multiple beam systems.

Recommended Reading

1. Pratt, T., Bostian, C. & Allnutt J., (2003): Satellite Communications, Wiley.
2. Maral, G. & Bousquet, M. (2002): Satellite Communications Systems, John Wiley and Sons Ltd.

Course Code:	DS 705
Course Title:	Instructional Design of Adult Learning Programs
Type of Course:	[OC-ES]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	S. Retalis, Associate Professor

Objective

This course presents, in theory and practice, subjects concerning the education of adults. It explores continuing lifelong learning, which is developed through the evolution of traditional approaches in the education of adults. Students attending the course will be introduced to the institutions, financing and policies of continuing education, will learn, how to determine the needs and practices of teaching adults, the role of instructor of adults, the psychology of adults and how to develop programs of training using modern methods of teaching. More specifically, the course aims the acquisition of knowledge and dexterities for all stages of designing adult learning programs, creating materials (in printed and digital form) for educational purposes (from analysis to evaluation and maintenance) through practices, standardised methods and models. Furthermore it emphasizes in practical subjects and particular in the techniques and tools that are developed for virtual training communities of adults.

Prerequisites: DS 706 - Instructional Methods.

Course Contents

Topics on adult educational principles, role of instructor of adults, design of adult learning programs, lifelong learning and employment, greek policy in adult education, quality assurance of adult learning programmes, advanced technologies for adult education such as mobile learning, adaptive educational hypermedia learning and computer supported collaborative learning communities.

Recommended Reading

1. Knowles, M.S., Holton, E.F. & Swanson, R.A. (1998): The Adult Learner: The Definitive Classic in Adult Education and Human Resource Development, Gulf Professional Publishing.
2. Jarvis, P. (2006): The Theory and Practice of Teaching, Routledge.

Course Code:	DS 514
Course Title:	e-Business
Type of Course:	[OC-ES]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	M. Themistocleous, Assistant Professor

Objective

This course presents baselines on digital economy. The focus is on the analysis and the understanding of the basic types of applications of e-business.

Prerequisites: -

Course Contents

E-business introduction. E-commerce presentation. Baselines on e-business micro-economy theory. Business requirements analysis for the design of e-commerce. Methodology for the design of successful web pages. Blogs. E-stores. Methodology for the design of e-stores. Design evaluation and faults detection through the use of web statistics applications. eGovernment. ebanking. ehealth. Business-to-business applications.

Recommended Reading

1. McGarvey, R. & Campanelli, M. (2005): Start Your own E-Business, Entrepreneur Press.
2. Chaffey, D. (2008): E-Business and E-Commerce Management (3rd Edition), Prentice Hall.

Course Code:	DS 517
Course Title:	Web Applications Development
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	V.-A. Stavroulaki, Assistant Professor

Objective

This course focuses on the development of Web applications and services with current technologies such as Java, XML,.NET. More specifically, the aim of the course is to provide an introduction on fundamental principles and concepts relating to the design and implementation of applications and Web services. In terms of specific technologies, this course covers programming and markup languages, and application frameworks such as HTML, XML, JavaScript, JSP, SOAP, WSDL, UDDI,. NET framework, etc.

Prerequisites: DS 327 - Network Services, DS 501 - C Programming, DS 502 - Object-Oriented Programming.

Course Contents

Introduction to web application development: Overview of key concepts, Protocols and languages, HTML, XHTML, XML, TCP / IP. Applications development for the client side: AJAX = JavaScript + XML. Applications development for the server side: Web Servers (Apache HTTP Server, Tomcat), JSP, Servlets, PHP. Web Services (Web Services): SOAP, WSDL, UDDI, SOAP RPC, Developing Web Services Using Java Web Services and Apache Axis SOAP engine. Introduction to Web Applications development with the .NET framework (Microsoft). "Mashups: Combining content and / or functionality of existing services and Web sites to provide new services / applications: Use of APIs such as GoogleMaps, Amazon, del.icio.us, Flickr.

Recommended Reading

1. Deitel, H. & Deitel, P. (2007): Internet & World Wide Web How to Program (4th Edition), Prentice Hall.
2. Sharp, J. (2007): Microsoft Visual C# 2008 Step by Step, Microsoft Press.

Course Code:	DS 806
Course Title:	Cryptography
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	C. Xenakis, Assistant Professor

Objective

The aim of this course is to support the students in learning the principles, concepts and applications of cryptography.

Prerequisites: -

Course Contents

Basic definitions and concepts. Information security. Symmetric cryptography. Digital signatures. Authentication. Public key cryptography. Hash functions. Integrity checking. Key management and random number generators.

Recommended Reading

1. Schneier, B. (1996): Applied Cryptography (2nd Edition), John Wiley & Sons.

2. Stallings, W. (2006): Cryptography and Network Security (4th Edition), Prentice Hall.

Course Code:	DS 310
Course Title:	Wireless Sensor Networks
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Alexiou, Assistant Professor

Objective

The objective of this course is to focus on short range communications with emphasis on adhoc networks, wireless sensor networks and applications.

Prerequisites: DS 304 - Wireless Communications.

Course Contents

Short range communications: Personal Area Networks (PAN), Body Area Networks (BAN), Ultra Wide Band communications. AdHoc Networks: Physical layer and transceiver design, MAC layer design, connectivity, topologies and routing. Wireless Sensor Networks: Information-theoretic bounds on sensor network performance, detection and estimation, cooperative transmission, localization and positioning, energy efficiency. Applications: eCommerce, safety, digital home, eHealth.

Recommended Reading

1. Swami, A. (Ed.) (2007): Wireless Sensor Networks: Signal Processing and Communications, John Wiley and Sons.

2. Kraemer, R. & Katz, M. (2008): Short-range wireless communications: Emerging technologies and applications, Wiley.

Course Code:	DS 324
Course Title:	Design and Optimization of Telecommunication Systems and Networks
Type of Course:	[OC-CSN]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Rouskas, Assistant Professor

Objective

This is an introductory course on the design, evaluation and optimization of networks and services. At the end of the course the students will be able to understand and evaluate different design alternative options at the early stages of data networks design.

Prerequisites: DS 320 – Computer Networks I, DS 321 – Computer Networks II.

Course Contents

Introduction to the design and performance evaluation of networks and services. Modelling and topological design of communication networks. Modelling of network services traffic and work load. Top-down network design under service requirements and various constraints. Network optimization techniques and algorithms. Network reliability. Performance measures. Quality of service assurance. Theoretical exercises and network design projects.

Recommended Reading

1. Oppenheimer, P. (2004): Top-Down Network Design (2nd Edition), Cisco Press.
2. McCabe, J.D. (2003): Network Analysis, Architecture and Design, 2nd Edition, Morgan Kaufmann Publishers Inc.

Course Code:	DS 311
Course Title:	Simulation of Telecommunication Systems and Networks
Type of Course:	[OC-CSN]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Rouskas, Assistant Professor

Objective

The course presents simulation techniques with emphasis on simulation of computer and communication networks. At the end of the course the students will be able to design and develop simulation programs for the study and performance evaluation of complex network communication models.

Prerequisites: DS 013 – Queuing Systems.

Course Contents

Introduction to dynamic discrete event systems. Development of discrete system models. Event-advance design, time-advance design, activity-based design. Pseudorandom number generation. Random variables generation. Overview of simulation languages and platforms. Development of simulation programs using general purpose programming languages. Measurement techniques. Traffic load and experiment design. Statistical analysis of simulation experiments, transient and steady state, data collection, confidence intervals. Variation reduction techniques. Simulation exercises and examples of telephone and data networks. Theoretical results verification.

Recommended Reading

1. Law, A.M. & Kelton, W. D. (1991): Simulation Modeling and Analysis, McGraw-Hill, Inc.
2. Issariyakul, T. & Hossain, E. (2008): Introduction to Network Simulator NS2, Springer.

Course Code:	DS 903
Course Title:	Human Resource Management
Type of Course:	[OC-ES]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Academic staff, Department of Business Administration

This course offered by Department of *Business Administration* of University of Piraeus.

Course Code:	DS 911
Course Title:	Entrepreneurship
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Academic staff, Department of Business Administration

This course offered by Department of *Business Administration* of University of Piraeus.

Course Code:	DS 910
Course Title:	Business Policy and Strategic
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	4th/ 7th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Academic staff, Department of Business Administration

This course offered by Department of *Business Administration* of University of Piraeus.

8th Semester

Course Code:	DS 323
Course Title:	Mobile and Personal Communication Networks
Type of Course:	[C]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Rouskas, Assistant Professor

Objective

The course presents the architecture and functional characteristics of mobile communication networks. Emphasis is given on the networking entities, the fixed network infrastructure and mobile services.

Prerequisites: -

Course Contents

Overview of mobile communication networks with emphasis on 2nd generation GSM and 3rd generation UMTS systems. Network architecture (network subsystems, functional layers, physical architecture, radiocoverage, mobility). Radiolink management (functions and procedures for radio management, handover procedure, handover in multi-layer architecture). Mobility management (paging and location update procedures). Communication management (call control, call setup, call release, complementary services, message services). Systems and standards GSM, HSCSD, GPRS, UMTS. Signaling protocols (SS7). Location based services (architectures, methods).

Recommended Reading

1. Lin, Y.-B. & Chlamtac, I. (2000): Wireless and Mobile Network Architectures, Wiley.

2. Redl, S. (1995): An Introduction to GSM, Artech House.

Course Code:	DS 515
Course Title:	Information Systems Management
Type of Course:	[CC-ES]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	M. Themistocleous, Assistant Professor

Objective

The course seeks to analyse managerial issues in the area of Information Systems such as IS adoption, evaluation, organizational change etc.

Prerequisites: DS 513 – Network Oriented Information Systems.

Course Contents

Information systems evolution. Social and economic impact of IS. IS adoption. IS evaluation. IS success. IS failure. IS and organizational change. IS and business value. IS strategy. Resistance to change and change management. IS and innovation. Value innovation. Exemplar cases. ERP systems.

Recommended Reading

1. Brown, C., DeHayes, D., Hoffer, J. Martin, W. & Perkings, W. (2008): Managing Information Technology (6th Edition), Pearson, Prentice Hall.

2. Turban, E., Leinder, D., Mclean, E. & Wetherbe, J. (2007): Information Technology for Management: Transforming Organizations in the Digital Economy, Wiley.

Course Code:	DS 802
Course Title:	Information Systems Security
Type of Course:	[CC-ES]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	Adjunct Lecturer

Objective

The acquaintance, familiarization and the acquisition of knowledge and application competencies by the students of techniques and methods used to protect the confidentiality, integrity and availability of information processed by IS and of the systems themselves.

Prerequisites: DS 801 - Security Policies and Security Management, DS 204 - Operating Systems I, DS 205 - Operating Systems II – UNIX, DS 512 - Information Systems, DS 806 - Cryptography.

Course Contents

Identification and Authentication: Authentication categories, Authentication data, Authentication systems, Biometric systems. Identity management: Examples, Technologies, Data protection. Access control: Access functions, Access matrices, Access control mechanisms. Policies and formal security methods: MAC, DAC, RBAC, Chinese wall, Formal descriptions. Operating systems security: Parameters, Mechanisms, Secure OS development, Case studies. Database systems security: Security requirements, Data integrity and system availability, Sensitive data security, Multi-level security, Oracle security. Malware: Categories, Types, Dealing with malware, Case studies.

Recommended Reading

1. Furnell, S., Katsikas, S., Lopez, J. & Patel A. (2008): Securing Information and Communication Systems. Principles, Technologies and Applications, Artech House.
2. Summers, R.C. (1997): Secure Computing: Threats and Safeguards, McGraw-Hill.

Course Code:	DS 302
Course Title:	Mobile Communication Systems
Type of Course:	[CC-CSN]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Kanatas, Associate Professor

Objective

The course provides the basic principles of cellular mobile communication systems. It also provides the methodologies of analysis and design of these systems. Emphasis is given on the physical layer and radio access

techniques. The course covers the radio communications technologies used by existing and future mobile cellular systems.

Prerequisites: DS 301 – Introduction to Telecommunications, DS 320 – Computer Networks I, DS 305 – Digital Communications, DS 304 – Wireless Communications.

Course Contents

Mobile communication systems. Cellular network architecture. Channel access techniques. Teletraffic and system performance issues. Radio channel. Interference and noise. Interference and noise effects on system performance (C/I calculations for different cellular systems). Handoff and channel allocation techniques. Techniques for spectral efficiency improvement. Principles and design techniques for the physical layer. Mitigation techniques. GSM and UMTS architecture, technology and services is also provided.

Recommended Reading

1. Rappaport, T. (2002): Wireless Communications: Principles and Practice, Prentice Hall PTR.
2. Molisch, A. (2005): Wireless Communications, IEEE.

Course Code:	DS 322
Course Title:	Network Management
Type of Course:	[CC-CSN]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	P. Demestichas, Associate Professor

Objective

The course teaches the functionality of the Data Link Layer (DLL), Medium Access Control (MAC) and Logical Link Control (LLC) layers.

Prerequisites: DS 309 - Broadband Networks.

Course Contents

Management functions. Cfaps. Configuration. Fault. Accounting. Performance. Security management. Element management. Network management. Service management. Business management. Managers. Agents. Management information base (MIB). Simple network management protocol (SNMP). Web-based management. Policy based management. Telecommunications management network (TMN).

Recommended Reading

1. Kurose, J. & Ross, K. (2004): Computer Networking: A top-down approach featuring the Internet. Prentice Hall.
2. Stallings, W. (2002): Data and Computer Communications, Prentice Hall.

Course Code:	DS 704
Course Title:	Knowledge and Competence Management
Type of Course:	[OC-ES]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	D. Sampson, Associate Professor

Objective

The goal of this course is to get students acquainted with the principles and techniques of Knowledge and Competence Management within the framework of Organizational Learning and to help them develop a set of critical skills that will enable them to employ Knowledge and Competence Management Systems.

Prerequisites: DS 510 - Web Programming, DS 707 – Digital Media in Education, DS 703 – e-Learning Systems, DS 516 – Semantic Web - XML.

Course Contents

Part A – Knowledge Management: Introduction to Knowledge Management. The nature of Knowledge (what Knowledge is, different Types of Knowledge: procedural-declarative, tacit-explicit, general-specific). Issues related with Knowledge Management (Knowledge Discovery, Knowledge Capture and Acquisition, Knowledge Sharing, Knowledge Application). Knowledge Management Systems. *Part B* – Competence *Management*: Introduction to Competence Management. Competence Models. International Specifications for Competence Description. Competence Management Systems.

Recommended Reading

1. Becerra-Fernandez, I., Gonzalez, A. & Sabherwal, R. (2004). Knowledge Management: Challenges, Solutions and Technologies. Pearson Prentice Hall, New Jersey.
2. Cheetham, G. & Chivers, G. (2005). Professions, Competence and Informal Learning. Edward Elgar Publishing.

Course Code:	DS 709
Course Title:	Collaborative Learning Environments
Type of Course:	[OC-ES]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	F. Paraskeva, Assistant Professor

Objective

This course introduces students in collaborative learning environments, social cognition and social constructivism as well as applications in digital learning/work environments (CSCL & CSCW).

Prerequisites: DS 706 - Instructional Methods, DS 509 - Human - Computer Interaction, DS 701 - Educational Digital Systems, DS 708 - Educational Psychology, DS 707 - Digital Media in Education, DS 703 - e-Learning Systems, DS 705 - Instructional Design of Adult Learning Programs.

Course Contents

CSCL in educational and working environment (ICTs) offers increasing possibilities for peer and collaborative learning. This is achieved by providing added value in the production of knowledge and constructive communication between teachers and learners, employers/employees, trainers/trainees etc. Socio-Cognitive approaches of learning, social constructivism models and collaborative learning environments. Collaboration and technology can facilitate sharing and distributing of knowledge and expertise among community members. The social & dialectical constructivism: Vygotskian Theory, Situative Learning, Cognitive Apprenticeship, Problem Based Learning, Communities of Practice. Evaluation of collaborative learning based on digital systems in schooling, training/vocational environments.

Recommended Reading

1. Dillenbourg, P., Fischer, F., Kollar, I., Mandl, H. & Haake, J.M. (2007). Scripting Computer-Supported Collaborative Learning, Springer.

2. Kobbe, L. (2006). Framework on multiple goal dimensions for computer-supported scripts, Kaleidoscope.

Course Code:	DS 804
Course Title:	Mobile and Wireless Communications Security
Type of Course:	[OC-CSN]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	C. Xenakis, Assistant Professor

Objective

The aim of this course is to enhance students' learning in security architectures applied in mobile/wireless communications.

Prerequisites: -

Course Contents

Security parameters/threats that threaten the mobile/wireless networks. Security measures in mobile/wireless networks like: Wireless Local Area Network (WLAN), Personal Area Network (PAN), Radio-frequency identification (RFID), Global System for Mobile communications (GSM), General Packet Radio Services (GPRS), Universal Mobile Telecommunication System (UMTS), 4th Generation (4G) heterogeneous networks, ad hoc networks and sensor networks.

Recommended Reading

1. Zhang, Y., Zheng, J. & Ma, M. (2008): Handbook of Research on Wireless Security, Information Science Reference.

2. Butty, L. & Hubaux, J.-P. (2007): Security and Cooperation in Wireless Networks: Thwarting Malicious and Selfish Behavior in the Age of Ubiquitous Computing, Cambridge University Press.

Course Code:	DS 312
Course Title:	Advanced Topics in Wireless Communications
Type of Course:	[OC-CSN]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Alexiou, Assistant Professor

Objective

This course focuses on wide area wireless networks and addresses advanced topics in physical layer design, multi-carrier systems and wireless standards evolution.

Prerequisites: DS 302 - Mobile Communication Systems.

Course Contents

Advanced physical layer design topics; Multi-carrier systems: OFDM/OFDMA; Radio resource allocation: multi-user communications and scheduling, cross-layer optimization; Wireless standards: 3G evolution, IEEE 802.x, 4G.

Recommended Reading

1. Rappaport, T. (2002): Wireless Communications: Principles and Practice, Prentice Hall.
2. Tse, D. & Viswanath, P. (2005): Fundamentals of Wireless Communication, Cambridge University Press.

Course Code:	DS 325
Course Title:	Intelligent Networks
Type of Course:	[OC-ES, OC-CSN]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Rouskas, Assistant Professor

Objective

The course presents modern technologies for the implementation of intelligent services of contemporary telecommunication networks.

Prerequisites: DS 326 – Internet Protocols.

Course Contents

Overview of basic networking protocols. Stream control transmission protocol. Session initiation protocol (SIP). IMS platforms and services. Intelligent networks architecture. Functional layers. IN conceptual model. Common channel signalling No 7 (SS7). ISUP and BISUP. BINAP. Wireless intelligent network services.

Recommended Reading

1. Poikselka, M. (2006): The IMS: IP Multimedia Concepts and Services, Wiley.

2. Russell, T. (2006): Signaling System #7 (5th Edition), McGraw-Hill.

Course Code:	DS 308
Course Title:	Performance Evaluation of Telecommunication Systems
Type of Course:	[OC-CSN]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	G. Efthymoglou, Assistant Professor

Objective

This course aims to evaluate the performance of various digital modulations in channels affected by noise and fading through the use of Monte Carlo simulation in the MATLAB software. Emphasis will be given in the evaluation of the performance of coded systems as well as the performance of digital systems that employ OFDM and CDMA techniques.

Prerequisites: DS 301 – Introduction to Telecommunications, DS 305 – Digital Communications.

Course Contents

Simulation in MATLAB software of algorithms at the transmitter and the receiver side that implement digital modulations such as: M-PSK, M-QAM, FSK, MSK, GMSK, and DPSK. Monte Carlo simulation for the evaluation of bit error rate (BER) and symbol error rate (SER) of these modulations in channels with Additive White Gaussian Noise (AWGN) and fading with Rayleigh statistics. Simulation of an Orthogonal Frequency Division Multiplexing (OFDM) system in MATLAB and analysis of its channel estimation algorithm. Simulation of a code division multiple access (CDMA) system in MATLAB and evaluation of its BER versus the number of users that simultaneously use the channel.

Recommended Reading

1. Proakis, J. & Salehi, M. (2001). Communication Systems Engineering (2nd Edition), Prentice Hall.

2. Harada, H. & Prasad, R. (2005): Simulation and Software Radio for Mobile Communications, Artech House Publishers.

Course Code:	DS 721
Course Title:	Healthcare Information Systems
Type of Course:	[OC-ES]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	F. Malamateniou, Assistant Professor

Objective

The main objective of the course is to introduce basic concepts of Healthcare Information Systems (HIS), to describe the main types of HIS, to study HIS architectural designs, development methodologies and interoperability with other systems and to present HIS challenges and perspectives. In addition, software tools will be used for the development of HIS for students' laboratory exercise.

Prerequisites: DS 512 - Information Systems, DS 511 - Workflow Systems, DS 507 - Software Engineering, DS 504 – Database Systems Design, DS 505 - Database Systems, DS 320 - Computer Networks I, DS 321 - Computer Networks II, DS 502 - Object-Oriented Programming, DS 802 - Information Systems Security.

Course Contents

Introduction to Healthcare Information Systems. Data and Information in Healthcare. Healthcare Information Systems Evolution. Examples of Healthcare Information Systems. Types of Healthcare Information Systems (Administrative, Clinical, Nursing). Healthcare Information Systems Architectures and Integration (e.g. SOA, EAI, ESB). Healthcare Information Systems Design, Development and Security. Challenges and Perspectives.

Recommended Reading

1. Wager, K., Lee, F. & Glaser, J. (2005): Managing Health Care Information Systems: A Practical Approach for Health Care Executives, Jossey-Bass.
2. van Bemmel J.H. & Musen, M.A. (2002): Handbook of Medical Informatics, Springer.

Course Code:	DS 203
Course Title:	Embedded Systems
Type of Course:	[OC-ES]
Year of Study/ Semester:	4th/ 8th
Theory/ Lab Sessions:	3 hours/ 2 hours
ECTS Credits:	5
Academic Personnel:	A. Meliones, Lecturer

Objective

The key objective of this class on Embedded Systems is to present a good understanding of embedded systems architecture as well as a detailed methodology for the multilayered design of embedded systems and their applications with emphasis on network embedded systems. Main topics of the class are the understanding of communication processors and system architecture, basic hardware design principles, Linux operating system porting on proprietary system architectures, as well as device driver programming. From this point on, system architecture is transparent to the development of embedded applications.

Prerequisites: DS 201 – Computer Architecture, DS 501 – C Programming, DS 320 – Computer Networks I.

Course Contents

Communication Processors (Architecture, integrated communication processor module, peripheral devices, memory map, I/O ports, peripheral device controllers and operation, interrupt handling). Hardware development tools (Schematic design, PCB design, BOM, lab equipment). Hardware System Architecture (Sample integrated access device (IAD) system architectures, modular design, EMI standards). Device drivers (Peripheral and network devices, device driver programming, performance analysis of network devices). Development and performance evaluation of an ATM network access device. Embedded applications (Network services, web-based management, video surveillance, telephony, Asterisk PBX, home automation and domotics, voice interaction). Lab projects.

Recommended Reading

1. K. Yaghmour, J. Masters, G. Ben-Yossef, P. Gherum, "Building Embedded Linux Systems", O'Reily, 2008.
2. J. Peckol, "Embedded Systems: A Contemporary Design Tool", Wiley, 2007.
3. J. Corbet, A. Rubini, G. Kroah-Hartman, Linux Device Drivers, 3rd Edition, O'Reilly, 2005.

2.5 Postgraduate Programmes

2.5.1 Postgraduate Programme in "Technology Education and Digital Systems"

Code	Title	Year of Study/ Semester	ECTS Credits
Major A. E – Learning			
ΨΣ-ΗΜ-501	Human - Computer Interaction	1st/ 1st	7,5
ΨΣ-ΗΜ-701	Educational Design in Technology-Enhanced Learning	1st/ 1st	7,5
ΨΣ-ΗΜ-502	Web Programming	1st/ 1st	7,5
ΨΣ-ΗΜ-702	Learning Theories and Teaching Methodologies	1st/ 1st	7,5
ΨΣ-ΗΜ-703	Learning Management Systems	1st/ 2nd	7,5
ΨΣ-ΗΜ-704	Psychological and Social Contexts of E-Learning	1st/ 2nd	7,5
ΨΣ-ΗΜ-503	Semantic Web and Learning	1st/ 2nd	7,5
ΨΣ-ΗΜ-504	Systems Analysis and Design	1st/ 2nd	7,5
ΨΣ-ΗΜ-505	Workflow Systems	2nd / 3rd	7,5
ΨΣ-ΗΜ-705	Lifelong Learning	2nd / 3rd	7,5
ΨΣ-ΗΜ-506	Web Applications and Services	2nd / 3rd	7,5
ΨΣ-ΗΜ-706	Implementation and Evaluation of Educational Programs	2nd / 3rd	7,5
ΨΣ-ΗΜ-777	Master Thesis	2nd /4th	30
	Seminars	2nd /4th	-

Code	Title	Year of Study/ Semester	ECTS Credits
Major B. Digital Communications and Networks			
ΨΣ-ΕΔ-301	Wireless and Satellite Communications	1st/ 1st	7,5
ΨΣ-ΕΔ-302	Network and Communications Infrastructure	1st/ 1st	7,5
ΨΣ-ΕΔ-501	Network Programming	1st/ 1st	7,5
ΨΣ-ΕΔ-801	Communications and Network Security	1st/ 1st	7,5
ΨΣ-ΕΔ-303	Design of Wireless Networks	1st/ 2nd	7,5
ΨΣ-ΕΔ-320	Mobile Communication Networks	1st/ 2nd	7,5
ΨΣ-ΕΔ-321	Embedded and Autonomous Systems	1st/ 2nd	7,5

Code	Title	Year of Study/ Semester	ECTS Credits
ΨΣ-ΕΔ-304	Broadband Networks	1st/ 2nd	7,5
ΨΣ-ΕΔ-305	Operating Systems and Mobile Terminal Applications	2nd / 3rd	7,5
ΨΣ-ΕΔ-322	Design and Management of Computer Networks	2nd / 3rd	7,5
ΨΣ-ΕΔ-901	ICT Project Management	2nd / 3rd	7,5
ΨΣ-ΕΔ-306	Performance Evaluation of Telecommunication Systems	2nd / 3rd	7,5
ΨΣ-ΕΔ-333	Master Thesis	2nd /4th	30
	Seminars	2nd /4th	-

Major C.   Network Oriented Systems

Code	Title	Year of Study/ Semester	ECTS Credits
ΨΣ-ΔΚ-501	Web Programming and Applications	1st/ 1st	7,5
ΨΣ-ΔΚ-502	Advanced Information Systems	1st/ 1st	7,5
ΨΣ-ΔΚ-301	Computer Networks	1st/ 1st	7,5
ΨΣ-ΔΚ-503	Systems Development Methodologies	1st/ 1st	7,5
ΨΣ-ΔΚ-504	Data Management	1st/ 2nd	7,5
ΨΣ-ΔΚ-302	Computer Networks Design and Management	1st/ 2nd	7,5
ΨΣ-ΔΚ-505	Business Process Management	1st/ 2nd	7,5
ΨΣ-ΔΚ-506	Network Programming	1st/ 2nd	7,5
ΨΣ-ΔΚ-801	Network-Oriented Systems Security	2nd / 3rd	7,5
ΨΣ-ΔΚ-507	Network-Oriented Systems Applications	2nd / 3rd	7,5
ΨΣ-ΔΚ-508	Network-Oriented Systems Governance	2nd / 3rd	7,5
ΨΣ-ΔΚ-509	Service Oriented Architectures	2nd / 3rd	7,5
ΨΣ-ΔΚ-555	Master Thesis	2nd /4th	30
	Seminars	2nd /4th	-

2.5.2 Postgraduate Programme in "Technology Education and Digital Systems" - Individual Course Description

Major A.   E – Learning

1st Semester

Course Code:	ΨΣ-HM-501
Course Title:	Human - Computer Interaction
Type of Course:	Compulsory
Year of Study/ Semester:	1st /1st
ECTS Credits:	7,5
Faculty:	S. Retalis, Associate Professor

Objective

The course emphasizes on the user interface design and the usability engineering methods for interactive systems. Students will gain knowledge and skills in the design of graphical user interface of interactive multimedia applications, participatory design, interaction design guidelines, and usability evaluation.

Course Contents

Cognitive models, visual coding, focus and memory, knowledge representation and management. Interaction technologies. Input/output devices, graphical environments, direct manipulation, collaborative systems, virtual reality. User-centered design methodologies, usability requirements, task analysis. Dialogue and internet interfaces design. System design - hierarchical task analysis. Prototyping. Usability evaluation methods and techniques. Interaction design patterns. Graphical user interface of special purpose interactive systems such as computer-supported cooperative work, systems for users with special needs, desktop VR systems.

Recommended Reading

1. Alan Dix, Janet Finlay, Gregory Abowd & Russell Beale (2004). Human-Computer Interaction, Prentice Hall, ISBN 0-13-046109-1.

2. Andrew Sears and Julie A. Jacko (2007). The Human-Computer Interaction Handbook, CRC Press, ISBN 0-8058-5870-9.

Course Code:	ΨΣ-HM-701
Course Title:	Educational Design in Technology-Enhanced Learning
Type of Course:	Compulsory
Year of Study/ Semester:	1st /1st
ECTS Credits:	7,5
Faculty:	D. Sampson, Associate Professor

Objective

The main objectives of this course are to introduce the basic concepts of Educational Design and present methods and tools that support Educational Design within the context of Technology Enhanced Learning.

Course Contents

Educational Design: Definitions and Key Concepts. Taxonomy of Educational Objectives. Overview of Teaching Models and Strategies. Rethinking Educational Design for Technology-Enhanced Learning Environments. Educational Activities: Definitions and a Classification (the DialogPlus Ontology). Educational Design Lab I: the Dialog Plus Nugget Developer Guidance Toolkit. Educational Design Lab II: LAMS. Case Studies of Educational Designs in Technology-Enhanced Learning.

Recommended Reading

1. Beetham, H. and Rhona, S. (Eds.), Rethinking pedagogy for a digital age: designing and delivering e-learning, London: Routledge, 2007.

2. Oliver M. and Conole G. (Eds.), Contemporary Perspectives in E-learning Research: Themes, Methods and Impact on Practice, The Open and Flexible Learning Series, London: Routledge, 2006.

3. Charles Reigeluth (Editor), Instructional-Design Theories and Models: A New Paradigm of Instructional Theory, Vol. 2, Lawrence Erlbaum Associates, 1999.

4. Marsha Weil, Emily Calhoun, Bruce R. Joyce, Models of Teaching (6th Edition), Allyn & Bacon, 2000.

5. Walter Dick, Lou Carey, James O Carey, The Systematic Design of Instruction (6th Edition), Pearson/ Allyn & Bacon, 2001.

Course Code:	ΨΣ-HM-502
Course Title:	Web Programming
Type of Course:	Compulsory
Year of Study/ Semester:	1st /1st
ECTS Credits:	7,5
Faculty:	A. Prentza, Assistant Professor

Objective

The course seeks to familiarize students with the main technologies involved in the development of static and dynamic Internet applications HTML, CSS, PHP and XML. The course takes place in a lab setting. Teaching consists of the presentation of the programming techniques available for creating Internet applications illustrated through specific coding examples. Students must then extend/modify the given code.

Course Contents

Introduction to Internet technologies and application development, Introduction to HTML. Using CSS to format web pages. Introduction to the development of dynamic web applications using PHP, Basic PHP syntax. Structure of PHP (variables, data types, arrays, control structures, functions). Creating web applications (HTML forms and PHP, files and directories), Connecting to databases. Introduction to XML, XML document structure, well-formed versus valid documents. Creating a DTD, Entities and Notations in DTD, Validation and Using DTDs. XML with CSS. Using XML namespaces. XSL, Transformation with XSLT.

Recommended Reading

1. Larry Ullman (2008), PHP for the World Wide Web, publisher Peachpit Press, 3rd Edition.

2. Julie Meloni (2008), Sams Teach Yourself PHP, MySQL and Apache All in One, publisher Sams, 4th Edition.

3. Luke Welling & Laura Thomson (2008), PHP & MySQL Web Development, publisher Addison-Wesley Professional, 4th Edition.

4. Young, M. (2002). XML Step-by-step, publisher Microsoft Press, 2nd Edition.

5. Harvey M. Deitel, Paul J. Deitel, Tem R. Nieto, Ted Lin, Praveen Sadhu (2000), XML How to Program, publisher Prentice Hall.

Course Code:	ΨΣ-HM-702
Course Title:	Learning Theories and Teaching Methodologies
Type of Course:	Compulsory
Year of Study/ Semester:	1st /1st
ECTS Credits:	7,5
Faculty:	F. Paraskeva, Assistant Professor

Objective

This course is designed to promote a fundamental understanding of the theoretical and applied knowledge related to theories of learning and the applications to the educational environments with emphasis on e-learning, through design, development, implementation and evaluation of e-learning tools and environments.

Course Contents

This course introduces to the theoretical overview of how human learning occurs according to the various learning theories and examines how instructional methodologies enriched by new technologies can accommodate the learning process correspondingly. In particular, by this course we attempt to interpret the phenomenon of learning through the examination of the principles, the methods (strategies and techniques) and the applications in digital learning environments, regarding the development of instructional methodologies for e-learning solutions. In the context of the course content, it is examined the behavioral and cognitive approach, the constructivist theories (cognitive and social) for e-learning solutions.

Recommended Reading

1. Snowman, J. Biehler, R. (2006): Psychology Applied to Teaching, Eleventh Edition, HOUGTON AND MIFFLIN, http://college.hmco.com/education/snowman/psych_app/11e/students/index.html.

2. Elliot, S.N., Kratochwill, T.R., Cook, J.L. and Travers, J.F. (2008). Educational Psychology, ed.: Agg. Lion, Effie Sygkollitou,by Guternberg.

3. Koliadis, E. (2005): Learning Theories and Educational Practice, Behavioral, SocioCognitive, Cognitive Learning Theories and Cognitive Psychology, Cognitive Neuroscience t. A, B, C & D.

4. Slavin, R. (2007). Educational Psychology: Theory and practice Publishing Borderline.

5. Joyce B. & Weil M. (2000): Models of Teaching, 6th ed. Allyn and Bacon.

6. Woolfolk, A.E. (2000): Educational Psychology, 6th ed. Allyn-Bacon, Boston.

7. Matsagouras, H. (1998). Theory and Practice of Teaching Strategies Teaching II - Critical thinking in the classroom, Gutenberg. ISBN: 978-960-01-0659-2.

8. Trilianos, A. (2002). Critical thinking and teaching, by Perivolaki and Atrapos.

9. Paraskeva, F. & Papagianni, A. (2008). 'Scientific and Educational Skills for Managers of Education' in the series 'Upgrading the quality of education', vol 4, ed PI.

2nd Semester

Course Code:	ΨΣ-HM-703
Course Title:	Learning Management Systems
Type of Course:	Compulsory
Year of Study/ Semester:	1st /2nd
ECTS Credits:	7,5
Faculty:	D. Sampson, Associate Professor

Objective

The objectives of this course are to present the basic design principles of e-learning systems, the state-of-the-art international specifications and standards in Learning Technologies (with emphasis to IEEE Learning Object Metadata, SCORM, IMS Common Cartridge and IMS Learning Design) and case studies of e-Learning Systems from areas of selected applications such as Mobile Language Learning and e-Training for People with Disabilities.

Course Contents

Design Principles of e-Learning Systems. Overview of state-of-the-art International Specifications and Standards in Learning Technologies. Digital Educational Content and Learning Objects. Educational Metadata: the IEEE Learning Object Metadata (LOM) Specification and Tools. Web-based e-Courses: Sharable Content Object Reference Model (SCORM), IMS Global Learning Consortium Content Packaging (CP) and Simple Sequencing (SS) Specifications and Tools. Educational Modeling Languages: IMS Learning Design Specification and Tools. Case Study: e-Training for People with Disabilities (eAccess2Learn). Case Study: Mobile Language Learning.

Recommended Reading

1. Adelsberger, H.H., Kinshuk, Pawlowski, J.M. and Sampson, D.G. (2008). Handbook on Information Technologies for Education and Training. Springer. 466p, ISBN: 978-3-540-74154-1.

2. Garriso D. R. and Anderson T. (2003). E-Learning in the 21st Century: A Framework for Research and Practice. RoutledgeFalmer.

3. Laurilland, D. (1993). Rethinking University Teaching – A Framework for the Effective Use of Educational Technology. Routledge-Taylor and Francis Group.

4. McGreal R. (2004) Online Education Using Learning Objects. Falmer Press.

5. Koper R. and Tattersall C. (2005). Learning Design: A Handbook on Modelling and Delivering Networked Education and Training. Springer.

6. Kukulska-Hulme, A. and Traxler, J. (Eds.), Mobile Learning, RoutledgeFalmer-Taylor & Francis Group, 2005.

Course Code:	ΨΣ-HM-704
Course Title:	Psychological and Social Contexts of E-Learning
Type of Course:	Compulsory
Year of Study/ Semester:	1st /2nd
ECTS Credits:	7,5
Faculty:	F. Paraskeva, Assistant Professor

Objective

This course focuses on theory, research and practice 1st/2nd, in relation to the factors that affect communication, behavior and performance in e-learning environments. For this reason, we emphasize on social and on psychological factors, as these are formed by the use of digital systems in the modern society (digital communication and tools, well designed technological artifacts, virtual performance, e-learning applications).

Course Contents

Learning technologies change the ways in which we communicate, learn and interact in educational and business environments. By this course we emphasize on theory, research and practice concerning the factors and new ways that may affect communication, behavior and performance in e-learning environments. During the course period the students engage in a wide range of learning frameworks enriched by new technologies which result to psychological and social experience and changes.

Recommended Reading

1. Wood, A.F. & Smith, M.J. (2005): Online Communication: Linking Technology, Identity, and Culture, Lawrence Erlbaum Associates Publishers.

2. Dweck C.S. (2000): Self Theories: their role on Motivation, personality and Development, Taylor and Francis [ISBN 1-84169-024-4].

3. Bandura, A. (2003): Self Efficacy: the Exercise of Control, Freeman and Company, NY.

4. Bandura, A. (2002): Self-Efficacy in Changing Societies, Cambridge University Press.

5. Costa, E.de B., & Perkusich, A., (1997): Designing a multi-agent interactive learning environment, In Proceedings of ICCE '97, Malaysia.

6. Dai, D.Y. & Stenberg, R. (2004). Motivation, Emotion and Cognition, LEA, NY.

7. Daniels, H, Edward A. (2004): Psychology of Education, Routledge Falmer, Taylor & Francis Group, London.

8. Kaluzniacky, E. (2004). Managing Psychological factor in Information Systems Work, Information Science Publishing.

9. Kimble, C. & Hildreth, P. & Bourdon, I. (2008). Communities of Practice, IAP.

10. Gibson, D. & Aldich, C. & Prencky, M. (2007). Gamew and Simulations in Online Learning, Information Science Development, London.

11. Golder S. & Donath J., (2004): Social roles in electronic communities, For the Association of Internet Researchers (AoIR) conference Internet Research 5.0, Brighton, England.

12. Griffin, E. (2003): A First Look at Communication Theory, McGraw-Hill.

13. Johnson, W., Rickel, J., Lester, J., (2000): Animated pedagogical agents: face-to-face interaction in interactive learning environments, International Journal of Artificial Intelligence in education.

14. Maslow A. (2004) Intrapersonal Communication - Hierarchy og Needs -Chapter 10 In.

15. Sunck, D. & Zimmerman, B. (2008). Motivation and Self-Regulated Learning, Taylor and Francis, NY.

16. Paraskeva, F. & Papagianni, A. (2008). 'Scientific and Educational Skills for Managers of Education' in the series 'Upgrading the quality of education', vol 4, ed PI.

Course Code:	ΨΣ-HM-503
Course Title:	Semantic Web and Learning
Type of Course:	Compulsory
Year of Study/ Semester:	1st /2nd
ECTS Credits:	7,5
Faculty:	G. Vouros

Objective

This course aims at proving the necessary knowledge and skills for using semantic web technologies for the purposes of teaching and learning over the web. The course focuses on understanding, engineering, and deploying ontologies for organizing and exploiting learning/teaching material and learning objects during the educational process.

Course Contents

Course lectures are expected to cover: Basic notions, motivations, architecture(s) and introduction to semantic web technologies for knowledge management. From structured XML documents to the description of resources using RDF and RDFS. Ontologies: The OWL family of languages. Ontology Engineering: Methodologies and tools. Managing and deploying ontologies to the semantic web: Storage and exploitation, alignment, learning and evolution. Semantic portals, semantic wikis for learning.

Recommended Reading

1. Y.Sure "A Short Tutorial on Semantic Web", http://videolectures.net/training06_sure_stsw/, 2006.

2. E. Motta "Semantic Web Applications", http://videolectures.net/iswc07_motta_swa/, 2007.

3. Klyne, J.Caroll, "Resource Description Framework (RDF): Concepts and Abstract Syntax", http://www3.org/TR/rdf-concepts/, 2004.

4. D. Brickley, R.V.Guha, "RDF Vocabulary Description Language 1.0: RDF Schema", http://www3.org/TR/rdf-schema/, 2004.

5. P. Hayes "RDF Semantics", http://www3.org/TR/rdf-mt/, 2004.

6. E. Prud'hommeaux, A.Seaborne, "SPARQL Query Language for RDF", http://www3.org/TR/rdf-sparql-query/, 2007.

7. D. McGuiness, F.van Harmelen, "OWL Web Ontology Language Overview", http://www3.org/TR/owl-features/, 2004.

8. S. Bechhofer, F.van Harmelen, J.Hendler, I.Horrocks, D.McGuinness, P.Patel-Schneider. L.Stein, "OWL Web Ontology Language Reference", http://www3.org/TR/owl-ref/, 2004.

9. S. Smith, C.Welty, D.McGuinness "OWL Web Ontology Language: Guide", http://www3.org/TR/owl-guide/, 2004.

10. N. Noy, D.McGuinness, "Ontology Development 101: A Guide to Creating Your First

Ontology", http://ksl.stanford.edu/people/dlm/papers/ontology-tutorial-noy-mcguinness-abstract.html.

11. 10 S.Bechhofer, "An introduction to OWL", http://videolectures.net/iswc07_bechhofer_iowl/, 2007.

12. M. Bergman, "A Brief Survey of Ontology Development Methodologies", http://www.mkbergman.com/906/a-brief-survey-of-ontology-development-methodologies/, 2010.

13. Gomez Perez, "Ontological Engineering", http://videolectures.net/iswc07_perez_oem/, 2007.

14. J. Allemang, J.Hendler, "Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL", Elsevier & Morgan Kauffman Pub., 2008.

Course Code:	ΨΣ-HM-504
Course Title:	Systems Analysis and Design
Type of Course:	Compulsory
Year of Study/ Semester:	1st /2nd
ECTS Credits:	7,5
Faculty:	F. Malamateniou, Assistant Professor M. Poulymenopoulou

Objective

The main objectives of the course are to introduce the basic principles of systems analysis and design, to study IBM's Rational Unified Process (RUP) methodological framework which is based on an incremental, iterative, architecture centric and use-case driven approach, to introduce best practices on software development and the Unified Modeling Language (UML) and to use UML diagrams in e-learning systems modeling.

Course Contents

Software development best practices (e.g. develop iteratively, model visually, verify quality, use component architecture, manage requirements, and control changes). RUP methodological framework (phases, cycles, iterations, core workflows, work products, project design using RUP, etc). Object-oriented technology principles (object, class, encapsulation, message passing, inheritance, polymorphism, etc), Systems modeling using UML. UML diagrams (1) - Structure Diagrams, Behavior Diagrams, Interaction Diagrams. UML diagrams (2) - Structure Diagrams, Behavior Diagrams, Interaction Diagrams. UML and RUP. Case study: Modeling of a prototype e-learning system using UML. Laboratory exercises using IBM Rational software modeler. Laboratory exercises using IBM Rational software modeler. Laboratory exercises using IBM Rational software modeler.

Recommended Reading

1. Ambler S. The Object Primer: Agile Model-Driven Development with UML 2.0. Cambridge University Press, 2004.

2. Booch G, Jacobson I, Rumbaugh J (2005): The Unified Modeling Language User Guide. Addison-Wesley.

3. Fowler M (2003): UML Distilled: A Brief Guide to the Standard Object Modeling Language. Addison-Wesley.

4. Harmon P, Watson M (1998): Understanding UML: The Developer's Guide. Morgan Kaufmann Publishers.

5. Jacobson I, Booch G, Rumbaugh J (1999): The Unified Software Development Process. Addison-Wesley Professional.

6. Kruchten P (2003): The Rational Unified Process: An Introduction. Addison-Wesley Professional.

7. Stevens P (2006): Using UML: Software Engineering with Objects and Components. Addison Wesley.

3rd Semester

Course Code:	ΨΣ-HM-505
Course Title:	Workflow Systems
Type of Course:	Compulsory
Year of Study/ Semester:	2nd /3rd
ECTS Credits:	7,5
Faculty:	F. Malamateniou, Assistant Professor M. Poulymenopoulou

Objective

The main objectives of the course are to introduce basic principles of business process management (BPM), to study the functionality, architectures and security aspects of workflow systems, to describe how workflow technology can be used in the context of e-learning systems and to use workflow management systems (WfMS) in the development of workflow-based e-learning systems.

Course Contents

Introduction to business processes and workflows. Workflow dimensions, workflow terminology, workflow-based systems. Workflow management systems structure and architecture. Workflow management systems standards, Workflow Reference Model. Security aspects of workflow-based systems (e.g. authorization, audit trail). Process Concepts and Structure, Workflow patterns. Workflow-based e-learning systems. Laboratory exercises using Oracle BPM Studio.

Recommended Reading

1. Leymann F, Roller D (2000): Production Workflow: Concepts and Techniques, Prentice Hall.

2. Van der Aalst, W.M.P. & Van Hee K.M. (2002): Workflow Management: Models, Methods and Systems, MIT Press.

Course Code:	ΨΣ-HM-705
Course Title:	Lifelong Learning
Type of Course:	Compulsory
Year of Study/ Semester:	2nd /3rd
ECTS Credits:	7,5
Faculty:	S. Retalis, Associate Professor

Objective

This course presents, in theory and practice the way to design and implement learning programmes for adults. Students attending the course will be introduced to the EU and national policies for lifelong learning. They will acquire knowledge and skills about how to design adult learning programs using modern teaching methods, and networked technologies as well as creating learning resources that comply with learning technologies standards (e.g. IEEE LOM) and specifications (e.g. SCORM, IMS LD). They will also gain knowledge and skills in evaluating the quality of lifelong learning programs.

Course Contents

Principles of adult learning. EU lifelong learning policies. Role of instructor in lifelong learning programs. Development methodologies for adult learning programs using learning technologies standards (e.g. IEEE LOM) and specifications (e.g. SCORM). Quality assurance of adult learning programmes. Advanced technologies for adult education such as mobile learning, adaptive educational hypermedia learning and computer supported collaborative learning communities.

Recommended Reading

1. Malcolm S. Knowles, Elwood F. Holton, Richard A. Swanson (1998). The Adult Learner: The Definitive Classic in Adult Education and Human Resource Development, Gulf Professional Publishing, ISBN-13: 978-0884151159.

2. Peter Jarvis (2006). The Theory and Practice of Teaching, Routledge ISBN: 978-0-415-36525-3.

Course Code:	ΨΣ-HM-506
Course Title:	Web Applications and Services
Type of Course:	Compulsory
Year of Study/ Semester:	2nd /3rd
ECTS Credits:	7,5
Faculty:	C. Doulkeridis, Adjunct Lecturer

Objective

The course aims to make students familiar with technologies for the development of Web applications and services and their use in education. The course will equip students with skills to develop applications and Web services using technologies and tools such as XML, RDF, RSS, Blogs, Wikis,.NET, etc. During the course, students will develop web applications with an ultimate goal to become familiar with techniques suitable for use and deployment in the Web context. Moreover, students will develop skills and capabilities relevant to the discovery and evaluation of additional material on the subject of the course from appropriate knowledge sources.

Course Contents

Introduction: Basic Concepts, Overview of Markup Languages: HTML and XML. Semantic Web (1): Introduction, Basic Concepts. Semantic Web (2): Resource Description Framework (RDF). Web 2.0 Technologies (1): Basic Concepts, Overview of Technologies. Web 2.0 Technologies (2): Usage of Web 2.0 Technologies in Education. Web 2.0 Technologies (3): Usage of Web 2.0 Technologies in Education. Technologies for Web Development:

ASP.NET.Web Services (1): Definitions, Basic Principles, Architecture. Web Services (2): Implementation Examples and Lab Exercises.

Recommended Reading

1. Daconta, Michael C. et al., The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management, 2003.

2. Berners-Lee, T., Hendler, J. and Lassila, O., "The Semantic Web", Scientific American, May 2001.

3. Deitel & Deitel: Internet and World Wide Web: How to Program, 3rd Edition, 2004.

4. Vladan Devedzic, Semantic Web and Education, Springer's Integrated Series in Information Systems, 2006.

5. D.Martin et al. "Bringing Semantics to Web Services with OWL-S", WWW Journal, pp. 243-277, 2007.

6. Grigoris Antoniou and Frank van Harmelen, A Semantic Web Primer, 2nd Edition, 2008.

7. Mohsen Jamali, Hassan Abolhassani, Different Aspects of Social Network Analysis, Web Intelligence, pp.66-72, 2006.

8. L.Ding et al., Swoogle: a search and metadata engine for the semantic web, CIKM, pp.652-659, 2004.

Course Code:	ΨΣ-HM-706
Course Title:	Implementation and Evaluation of Educational Programs
Type of Course:	Compulsory
Year of Study/ Semester:	2nd /3rd
ECTS Credits:	7,5
Faculty:	D. Sampson, Associate Professor F. Paraskeva, Assistant Professor

Objective

The objectives of this course are to study the implementation and the evaluation of Technology-supported Educational Programs and to identify contemporary issues that present opportunities for further research and development.

Course Contents

Introduction to Research Methodology. Technology-supported ICT School Teaching using Scratch. Exploiting 3D Virtual Learning Environments in education. Integrating Digital Games Into School Curriculum. Design, Implementation and Evaluation of a Web-Based Tool for Development and Management of IEEE LOM Application Profiles (ASK-LOM-AP)**.** Design, Implementation and Evaluation of a tool for web-based social tagging of digital educational resources (ASK-LOST). Design, Implementation and Evaluation of a SCORM Player for Mobile Devices (ASK Mobile SCORM Player)**.** Design, Implementation and Evaluation of an e-Portfolio based on self-regulation to support higher education students. Digital Games: Motivation and Learning. Teaching Role-Playing Instruction in Second Life: An Exploratory Study. Strategies of affective factors development in Computer Supported Collaborative Environments.

Recommended Reading

1. Keith F. Punch, Developing Effective Research Proposals, Sage Publications Ltd, 2000.

2. Louis Cohen, Lawrence Manion, Keith Morrison, Research Methods in Education, 6th Edition, Routledge.

3. Jan Van den Akker, Koeno Gravemeijer, Susan McKenney, and Nienke Nieveen, Educational Design Research, Routledge, 2006.

4. Victor Kaptelinin and Bonnie A. Nardi, Acting with Technology, Activity Theory and Interaction Design, The MIT Press, 2006.

Major B.   Digital Communications and Networks

1st Semester

Course Code:	ΨΣ-ΕΔ-301
Course Title:	Wireless and Satellite Communications
Type of Course:	Compulsory
Year of Study/ Semester:	1st /1st
ECTS Credits:	7,5
Faculty:	A. Kanatas, Associate Professor

Objective

The course includes two sections. In the first section we attempt a review of fundamental concepts of antenna technology and electromagnetic propagation. An analytic description of propagation aspects in current wireless communication systems is given for the mostly used frequency bands. Propagation mechanisms and prediction models are provided for successful design of fixed wireless access systems. We analyze international standards and recommendations (ITU-R) for the efficient design of wireless links providing the critical metrics and quality parameters. The section closes with the analysis of antenna arrays, the methods used for array signal processing and typical applications of optimum beam formers. The second section deals with the review of Satellite communications networks technology providing the current state of structural blocks of these networks, discussing the multiple access techniques and network topologies used. Typical examples are given for VSAT networks and the design of satellite links.

Course Contents

Electromagnetic waves, antennas and antenna parameters. Electromagnetic wave propagation: Reflection, Refraction, Troposphere. Electromagnetic wave propagation: Scattering, Diffraction, propagation models. Analysis of Antenna Arrays. Array Signal Processing. Digital Beamforming Techniques. Satellite Communication Networks Technology I. Satellite Communication Networks Technology II. Satellite Link Design. Multiple Access Techniques & VSAT Networks.

Recommended Reading

1. «Wireless Communications», in Greek by A. Kanatas, P. Constantinou, and G. Pantos, 2010.

2. «Antenna Theory Analysis and Design», C. Balanis, 3rd Edition, John Wiley & Sons, 2005.

3. «Wireless Communications», T. Rappaport, 2nd edition, Prentice Hall, 2002.

4. «Propagation of Radiowaves», Les Barclay, 2nd Edition, IEE, 2002.

5. «Satellite Communications», T. Pratt, C.W. Bostian, J.E. Allnutt, John Wiley & Sons, 2nd Edition, 2002.

6. «Satellite Communications Systems», G. Maral, M. Bousquet, John Wiley & Sons, 4th Edition, 2002.

Course Code:	ΨΣ-ΕΔ-302
Course Title:	Network and Communications Infrastructure
Type of Course:	Compulsory
Year of Study/ Semester:	1st /1st
ECTS Credits:	7,5
Faculty:	A. Alexiou, Assistant Professor

Objective

This courses aims to analyze the basic principles, fundamental technologies and infrastructures in communication and computer networks. The first part of the course addresses wide area networks infrastructures, focusing on physical layer and multiple access issues. Metropolitan area networks and local area networks infrastructures are investigated in the second part. Finally, in the last part, pervasive communication systems infrastructures are studied, placing the emphasis on personal area networks, wireless sensor networks and RFID technologies.

Course Contents

Introduction: Communication and Computer Networks Infrastructures – Basic principles and technologies. Wide area networks infrastructures: Voice and data transmission over telephones cables, Mobile communication networks (2G, 3G, 4G). Metropolitan area networks infrastructures: Fixed wireless access networks, Mobile metropolitan area networks. Local area networks infrastructures: Baseband transmission, Multiple access, Quality of Service. Pervasive communications systems infrastructures: Personal area networks, Wireless sensor networks, RFID technologies.

Recommended Reading

1. Behrouz A. Forouzan, "Data Communications and Networking", Fourth edition, McGraw-Hill (2007).

2. W Stallings, "Wireless Communications and Networks", Prentice Hall (2004).

3. D. Tse, P. Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press (2005).

4. Bernhard H. Walke, Stefan Mangold, Lars Berlemann, "IEEE 802 Wireless Systems: Protocols, Multi-Hop Mesh/Relaying, Performance and Spectrum Coexistence", Wiley (2006).

5. Uwe Hansmann et al, "Pervasive Computing: The mobile world", (Springer 2003).

6. Lu Yan (Editor), Yan Zhang (Editor), Laurence T. Yang (Editor), Huansheng Ning (Editor), "The Internet of Things", Auerbach Publications (2008).

7. Swami, A. (editor), "Wireless Sensor Networks: Signal Processing and Communications", John Wiley and Sons (2007).

Course Code:	ΨΣ-ΕΔ-501
Course Title:	Network Programming
Type of Course:	Compulsory
Year of Study/ Semester:	1st /1st
ECTS Credits:	7,5
Faculty:	N. Sgouros, Professor, B.-A. Stavroulaki, Assistant Professor

Objective

The goal of this course is to familiarize students with the basic principles of programming network applications using the Java programming language. The course consists of laboratory sessions. More specifically, the course presents the basic programming techniques for the implementation of various internet applications while describing the main features of programming code that implements the specific applications. The students must then work on extending/upgrading/modifying the given code.

Course Contents

Complex & Polymorphic Data Types. Event-driven Programming. User Interface Development using the Java Swing library. Thread Programming. I/O streams. Socket programming. Client/Server implementation. Remote procedure call (Java RMI). Development of a Prototype Implementation. Efficiency of Applications.

Recommended Reading

1. W. Richard Stevens, "UNIX NETWORK PROGRAMMING (VOL. 1: Networking APIs: Sockets and XTI)", Prentice Hall 1998.

2. W. Richard Stevens, "UNIX NETWORK PROGRAMMING (VOL. 2: Interprocess Communications)", Prentice Hall 1999.

3. "UNIX Network Programming, Volume 2: Interprocess Communications", W. Richard Stevens, Prentice Hall, 2nd edition, 1998.

4. "Client/Server Survival Guide", Robert Orfali, Dan Harkey, and Jeri Edwards 3rd Edition, Wiley.

5. Java Tutorials (http://download.oracle.com/javase/tutorial/).

Course Code:	ΨΣ-ΕΔ-801
Course Title:	Communications and Network Security
Type of Course:	Compulsory
Year of Study/ Semester:	1st /1st
ECTS Credits:	7,5
Faculty:	K. Lambrinoudakis, Assistant Professor C. Xenakis, Assistant Professor

Objective

The main objective of this lesson is to study and analyze the security issues encountered in communications and networks. It focuses on wired networks, which are based on the Internet technology, that provide computer communications and networked services.

Course Contents

Introduction to Communications and Networks Security. Basic issues in Cryptography. Public Key Infrastructure. Key Agreement, Key management, Digital certificates and Digital Signatures. Firewalls. Virtual Private Networks and Web Security. Authentication and Privacy. Attacks in Privacy and Privacy Requirements. Non Linkability, Non Detectability, and Non Traceability. Privacy Enhancing Techniques.

Recommended Reading

1. William Stallings, (2007): Network Security Essentials: Applications and Standards, 3/E, Publisher: Prentice Hall.

2. John R. Vacca, (2009): Computer and Information Security Handbook, Publisher: Morgan Kaufmann Publishers, Elsevier.

2nd Semester

Course Code:	ΨΣ-ΕΔ-303
Course Title:	Design of Wireless Networks
Type of Course:	Compulsory
Year of Study/ Semester:	1st/2nd
ECTS Credits:	7.5
Faculty:	A. Kanatas, Associate Professor

Objective

The course aims at a comprehensive presentation of the analysis and design of existing and new wireless communication networks. The area of wireless communication is one of the most dynamic areas in the communication field. The course covers the wireless channel characteristics and the transmission and reception techniques developed to cope with the channel impairments. Next, the design techniques of wireless systems are discussed and case studies are examined. Indeed, the characteristics and the fundamentals of existing systems (2G, 3G and 4G) are provided and a flavor of open research topics is given.

Course Contents

Categories of wireless communications networks. Coverage, services and performance requirements of wireless networks. Network examples. Duplexing techniques, multiple access techniques and random access. Fundamentals of cellular network design. Propagation environment, mechanisms and propagation phenomena. Fading, types of fading, delay spread and intersymbol interference. Doppler spread and time variance. Analytic and empirical propagation channel models for outdoor and indoor environments. Shadowing and lognormal distribution. Calculation of coverage range and percentage. Empirical calculation of model parameters. Noise and interference. Calculation of transmitted power based on SNR, and of reuse distance based on CIR. Adjacent channel interference. Spectral efficiency and techniques for improving the metrics (cell sectoring, cell splitting and channel assignment). Wideband channel characteristics. Flat, frequency selective and WSSUS channels. Characterization parameters (coherence bandwidth, coherence time, etc.). Fading mitigation techniques

(diversity, OFDM, interleaving). Narrowband channels and characterization parameters. Scattering models and Rayleigh or Ricean fading. Case study, Design of a cellular mobile communications system step-by-step. Diversity techniques (space and time) and spatial multiplexing. From SISO to SIMO, MISO and MIMO systems. Structure, architecture and functionalities of existing wireless communication systems (examples from GSM, GPRS, UMTS, HSPA, LTE and WiMAX). Case Study, Initial planning of a WiMAX system in urban environment.

Recommended Reading

1. «Mobile Communication Systems», in Greek by A. Kanatas, P. Constantinou and G. Pantos, Papasotiriou S.A., 2010.

2. «Wireless Communications», T. Rappaport, 2nd edition, Prentice Hall, 2002.

3. «WCDMA for UMTS», Holma and Toskala (Editors), Fifth Edition, Wiley, 2010.

4. «The Mobile Radio Propagation Channel», J.D. Parsons, 2nd Edition, Pentech Press, 2000.

5. «Wireless Communications», A. Molisch, Wiley, 2005.

6. «Fundamentals of Wireless Communications», D. Tse, P. Viswanath, Cambridge University Press, 2005.

Course Code:	ΨΣ-ΕΔ-320
Course Title:	Mobile Communication Networks
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	A. Rouskas, Assistant Professor

Objective

The main objective of the course is the presentation of modern mobile communication networks architecture and technologies. At the end of the course, the students will be able to analyze and evaluate the main principles and planning design options for mobile communication networks. The students will work on a small project in a relative subject of mobile communications.

Course Contents

Overview of mobile communication networks (1G, 2G, 2.5G, 3G, 3.5G), functional model, architecture and components. Wireless communications, multiple access techniques. Traffic analysis and modeling, wireless network dimensioning. Radio resource management. Communication management. Mobility management in cellular and wireless IP networks. Wireless packet scheduling. Contemporary networks and standards (HSPA, mWiMAX). IMS architecture and services. Design issues in next generation systems (4G).

Recommended Reading

1. Kumar, Danjunath and Jury, Wireless Networking, Morgan Kaufmann 2008, ISBN 978-0-12-374254-4.

2. Garg, Wireless Communications and Networks, Morgan Kaufmann 2007, ISBN 978-0-12-373580-5.

3. Glisic, Advanced Wireless Networks: 4G Technologies, Wiley 2006, ISBN 978-0-470-01593-3.

4. Schwartz, Mobile Wireless Communications, Cambridge University Press, 2005, ISBN 0-521-84347-2.

5. Mark and Zhuang, Wireless Communications and Networking, Prentice Hall 2003, ISBN 0-13-040905-8.

6. Stallings, Wireless Communications and Networks, Prentice Hall 2002, ISBN 9780131918351.

Course Code:	ΨΣ-ΕΔ-321
Course Title:	Embedded and Autonomous Systems
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	N. Sgouros, Professor
	A. Meliones, Lecturer

Objective

Embedded Systems section. The key objective of this part of the class is to present a good understanding of embedded systems architecture as well as a detailed methodology for the multilayered design of embedded systems and their applications with emphasis on network embedded systems. Main topics covered are the understanding of communication processors and system architecture, basic hardware design principles, Linux operating system porting on proprietary system architectures, as well as device driver programming. From this point on, system architecture is transparent to the development of embedded applications.

Autonomous Systems section. The goal of the specific section is to familiarize students with the basic principles underpinning the functioning and implementation of autonomous systems, i.e. of systems capable of autonomous actions without human intervention. The course consists of seminar and laboratory sessions. More specifically, seminar sessions analyze the basic features of autonomous systems while laboratory sessions focus on the implementation of systems with the analyzed features.

Course Contents

Embedded Systems topics: Communication Processors: Architecture, integrated communication processor module, peripheral devices, memory map, I/O ports, peripheral device controllers and operation, interrupt handling. - Schematic modular design and sample system architectures.- Embedded system software and processes: Basic system initialization, bootloader configuration, kernel architecture, kernel configuration and porting, cross compiling, debian packages, embedded file system.-Device drivers: Peripheral and network devices, device driver programming, performance analysis of network devices, ATM network access device.- Embedded applications: Network services, web-based management, video surveillance, telephony, home automation and domotics. - Lab project: Development of an embedded video surveillance application.

Autonomous Systems topics: Conceptual features of autonomous systems. Architectures for Intelligent Agents. Action Planning in Autonomous Systems. Communication and Collaboration in Autonomous System Populations. Applications of Autonomous Systems.

Recommended Reading

Embedded Systems

    1. Meliones, "Network Embedded Systems", University Press.

    2. W. Wolf, Computers as Components: Principles of Embedded Computing Systems, Academic Press, 2001.

    3. K. Yaghmour, J. Maste rs, G. Ben-Yossef, P. Gherum, "Building Embedded Linux Systems", O'Reily, 2008.

    4. J. Corbet, A. Rubini, G. Kroah-Hartman, "Linux Device Drivers", 3rd Edition, O'Reilly, 2005.

5. D. Bovet, M. Cesati, "Understanding the Linux Kernel", 3rd Edition, O'Reilly, 2005.

6. M. Barr, A. Massa, "Programming Embedded Systems: With C and C++ Development Tools", 2nd Edition, O'Reilly, 2006.

7. T. Noergaard, "Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers", Newnes, 2005.

8. P. Raghavan, A. Lad, S. Neelakandan, "Embedded Linux System Design and Development", Auerbach Publications, 2005.

Autonomous Systems

1. Wooldridge M., An Introduction to Multiagent Systems, Wiley, 2009.

2. Braitenberg, V., Vehicles: Experiments in Synthetic Psychology, MIT Press, 1986.

3. Liu, J., Autonomous Agents and Multiagent Systems: Explorations in Learning, Self Organization and Adaptive Computation, World Scientific, 2001.

4. Russel S, Norvig P., Artificial Intelligence: A Modern Approach, Prentice Hall, 2009.

Course Code:	ΨΣ-ΕΔ-304
Course Title:	Broadband Networks
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	A.Alexiou, Assistant Professor

Objective

In this course broadband technologies are studied, focusing on the latest technological developments and advanced design techniques and architectures for next generation broadband networks. In the first part, requirements, technology trends and challenges in the design of broadband networks and the realization of broadband applications are analyzed. In the next three parts of the course, wireline, wireless and optical broadband networks are studied, in particular baseband transmission and signal processing, physical layer design, multiple access schemes and network architecture issues. In the final part of the course, cutting-edge technological developments and related research topics are discussed.

Course Contents

Introduction: Broadband access – requirements, trends, challenges and applications. Fundamental principles in digital transmission. Efficient use of spectrum. Transmission media – requirements and limitations. Wireline Broadband Access: Digital Subscriber Line. Ethernet. Wireless Broadband Access: Wide area networks (LTE, LTE-Advanced). Metropolitan area networks (IEEE 802.16m). Local area networks (IEEE 802.11n). Personal area networks (High Rate WPAN). Optical technologies: Optical fibre. Synchronous Optical Networks. Passive Optical Networks. Advanced broadband technologies and hot research topics.

Recommended Reading

1. Travis Russel, "Telecommunication Protocols", McGraw-Hill (1999).

2. Behrouz A. Forouzan, "Data Communications and Networking", Fourth edition, McGraw-Hill (2007).

3. W Stallings, "Wireless Communications and Networks", Prentice Hall (2004).

4. T. S. Rappaport, "Wireless Communications –Principles and Practice", Prentice Hall (2001).

5. D. Tse, P. Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press (2005).

6. Bernhard H. Walke, Stefan Mangold, Lars Berlemann, "IEEE 802 Wireless Systems: Protocols, Multi-Hop Mesh/Relaying, Performance and Spectrum Coexistence", Wiley (2006).

3rd Semester

Course Code:	ΨΣ-ΕΔ-305
Course Title:	Operating Systems and Mobile Terminal Applications
Type of Course:	Compulsory
Year of Study/ Semester:	2nd /3rd
ECTS Credits:	7.5
Faculty:	G. Efthymoglou, Assistant Professor A. Milionis, Lecturer V. Stavroulaki, Assistant Professor

Objective

The Android technology is being used in the latest smart mobile devices. The goal of this lab/course is for the students to understand the android computing platform and develop applications for mobile devices using the latest Android Software Development Kit (SDK). Working with Android applications, the students will gain experience with an interesting technology in the fast moving market segment of Internet-enabled phones.

Course Contents

Download/configure the Android SDK. Introduction to Android development tools for application development. Getting familiar with the Android emulator (Ref [1] chapters 2 and 3, Ref [2] chapters 1 and 2, Ref [3] chapter 2). Creating User Interfaces: using XML-based layouts (comparison with java powered layouts), basic widgets (labels, check boxes, buttons, input boxes, etc), containers (widget collections), input method framework, drop-down menus, fonts. Introduction to different layout methods (Ref [1] chapters 4 to 7, Ref [3] chapter 4). The Webkit browser: creating applications with the browser. Introduction to mobile browsing and webkit engine. Markup languages, CCS, and javascript. Embedding the webkit browser (Ref [1] chapter 13, and Ref [2] chapter 17). Using resources: string resources, layout resources, etc, working with arbitrary XML Resource files, working with Assets, etc (Ref [2] chapter 3 and Ref [1] chapter 20). Content Providers: using and building a content provider (Ref [2], chapters 25 to 27). Creating intent filters (Ref [2], chapter 17, Ref [3] chapter 5). Location based services, creating map-based activities, audio, video and using the camera (Ref [3], chapters 8 and 11). Dealing with real devices, handling multiple screen sizes and resolutions, etc (Ref. [2] chapter 19, and Ref [1] chapters 36, 37, 38). Specifications for course «project».

Recommended Reading

1. Mark L. Murphy, Beginning Android 2: Begin the journey toward your own successful Android 2 applications, Apress 2010.

2. Sayed Y. Hashimi, Satya Komatineni, Dave MacLean: Pro Android 2: Covers Google's Android 2 Platform including advanced topics such as OpenGL, Widgets, Text to Speech, Multi-Touch, and Titanium Mobile, Apress 2010.

3. Reto Meier, Professional Android 2 Application Development, Wrox Programmer to Programmer, Wiley Publishing, 2010.

Course Code:	ΨΣ-ΕΔ-322
Course Title:	Design and Management of Computer Networks
Type of Course:	Compulsory
Year of Study/ Semester:	2nd /3rd
ECTS Credits:	7,5
Faculty:	P. Demestichas, Associate Professor

Objective

The course "Design and Management of Computer Networks" aims at teaching the contemporary methodologies and technologies in the areas of design and management of computer networks. In this context, network design problems are presented and properly formulated, whereas algorithms for their solution are presented, developed and validated using commercial software packages. Furthermore, the fundaments of computer network management, with respect to functional, information and communication models, are presented, thoroughly discussed and validated. The course is in general comprised of both theoretical lectures and specialised laboratory and programming exercises and platform demonstrations.

Course Contents

Introduction: Course overview. Overview of computer networks. Modern computer networks. Wireless and wired access. Core networks. General presentation of computer network design, control and management problems. Wireline network design problems. Packet switching, circuit switching. IP access via DSL, LAN, optical systems. Core network design problems, Ethernet WANs, optical technologies. Wireless access network design problems. The cases of TDMA, CDMA and OFDMA for 2G, 3G, LTE, Femtocells, IEEE 802.x technologies, heterogeneous infrastructures. Radio resource management. Spectrum and power management. Network element topology problems. Interconnection with backhaul/core networks. Methods and Algorithms for solving computer network design problems: local search, greedy, (meta-)heuristics, simulated annealing, genetic algorithms, taboo search, neural networks, other bio-inspired and learning techniques. Application to the above network design problems. Programming exercises. Introduction to network management. CFAPS functionalities. Network Management levels. Manager, Agents. Management Information Base (MIB). Management of IP-based networks. SNMP protocol. SMI, ASN.1. MIB design and realization for network elements. Management based on the SNMP Protocol. MIBs content processing. Laboratory exercises. Design and Implementation of management applications based on the SNMP Protocol. MIBs content processing. Laboratory exercises. Management platform and tools. Demonstration and use of platforms and tools used today for monitoring, management and control of computer networks: HP Openview, SNMPc, MRTG. Modern methodologies and trends in computer network management: Self-*, Self-management, autonomic management, cognitive management, web-based management, policy based management, network governance.

Recommended Reading

1. D. Bertsekas, "Network Optimization: Continuous and Discrete Models", Athena Scientific, 1998.

2. D. Bertsekas, "Dynamic Programming and Optimal Control", Vols. I and II, Athena Scientific, 1995, (3rd Edition Vol. I, 2005, 2nd Edition Vol. II, 2001).

3. D. Bertsekas, R. Gallagher, "Data Networks ", Prentice-Hall, 1987 (2nd Ed. 1991).

4. D. Bertsekas, "Linear Network Optimisation, Algorithms and Codes", MIT Press, 1991.

5. Leinwand, K. Fang, "Network management a practical perspective", Addison-Wesley Inc.

6. Stallings W., "SNMP, SNMPv2 and CMIP: The practical guide to network management standards", Addison-Wesley Inc.

7. D. R. Mauro and K. J. Schmidt, Essential SNMP, O'Reilly, 2nd Edition, September 2005.

8. SNMP RFCs, available at http://www.snmp.com/protocol/snmp_rfcs.shtml.

9. Integrated Management of Networked Systems: Concepts, Architectures, and Their Operational Application (The Morgan Kaufmann Series in Networking), Heinz-Gerd Hegering, Sebastian Abeck, and Bernhard Neumair, 1999.

10. Andrew Tanenbaum, "Computer Networks".

11. James Kurose, Keith Ross, "Computer Networking: A Top-Down Approach Featuring the Internet".

12. Jean Walrand, "High Speed Networks".

13. Jean Walrand, "Computer Networks: A First Course".

14. Travis Russell, "Telecommunications Protocols".

Course Code:	ΨΣ-ΕΔ-901
Course Title:	ICT Project Management
Type of Course:	Compulsory
Year of Study/ Semester:	2nd /3rd
ECTS Credits:	7,5
Faculty:	F. Malamateniou, Assistant Professor M. Poulymenopoulou

Objective

The main objectives of the course are to introduce the main concepts of project management, emphasizing project management of digital systems, to study generally recognized, good project management practices, such as the ones included in the Project Management Body of Knowledge (PMBOK) of the Project Management Institute (PMI), and to use such practices in project management of digital (information and telecommunication) systems.

Course Contents

Introduction to project management (e.g. project definition, projects typology, triple constraint concept, a systems approach to project management, organizational influences). Project information systems and services life cycles. Project Management methodologies (e.g. PMI). Business cases of information technology projects (e.g. Measurable organizational value, feasibility study, Return on Investment, Cost Benefit Analysis). Development of project charters and project plans. Project Time and Recourse Management (e.g. Work Breakdown Structure, Project organization structure and responsibilities, Gantt charts, the critical path, network diagramming, PDM networks, CPM/PERT, Scheduling with resource constraints). Project estimation (e.g. Delphi

technique, Time boxing). Software engineering metrics and approaches (e.g. Lines of Codes, Function point analysis, COCOMO). Cost estimating and budgeting (e.g. cost estimating process, elements of budgets and estimates, budgeting using cost accounts). Project Control (e.g. the control process, traditional cost control, cost accounting systems for project control, project control process, performance analysis). Laboratory exercises using MS Project. Laboratory exercises using MS Project. Laboratory exercises using MS Project.

Recommended Reading

1. PMI Corporate authors, 2008, A Guide to the Project Management Body of Knowledge: (PMBOK Guide).

2. J. Reed, 2008, Project Management with PRINCE2 Best Practice Handbook: Building, Running and Managing Effective Project Management - Ready to use supporting documents bringing PRINCE2 Theory into Practice.

3. Jack. T. Marchewka, Information Technology Project Management: Providing Measurable Organizational Value, 2006, Wiley.

4. John. M. Nicholas, Project Management for Business and Engineering: Principles and Practice, 2004, Elsevier Inc.

Course Code:	ΨΣ-ΕΔ-306
Course Title:	Performance Evaluation of Telecommunication Systems
Type of Course:	Compulsory
Year of Study/ Semester:	2nd /3rd
ECTS Credits:	7.5
Faculty:	A.Kanatas, Associate Professor G. Efthymoglou, Assistant Professor

Objective

The core objective of this course is the development of a sound background in analysis and design of digital signal processing techniques for communication systems. The course takes place in the lab and the students are expected to work exclusively with MATLAB based programming. The course covers topics from source coding and digital signal representations to performance evaluation of well known digital techniques in wireless communication systems and channels.

Course Contents

Simulation Techniques of Communication Systems in MATLAB. Source Coding and Digital Modulation Techniques. Performance Evaluation of Wireless Communication Systems (BER and SER) in Fading Channels. Design and Performance Evaluation of Digital Receivers. Channel Coding Techniques. Diversity Techniques. Analysis and Design of OFDM Systems. Digital Beamforming Techniques. Adaptive Techniques. Analysis and Design of MIMO Systems.

Recommended Reading

1. "Communication Systems Engineering", by J. Proakis and M. Salehi, Second Edition, Prentice Hall, 2001.

2. "Principles of Communications Systems Simulation with Wireless Applications", by W. H. Tranter, K. Sam Shanmugan, T. S. Rappaport, and K. L. Kosbar, Prentice Hall, 2004.

3. "Simulation and software radio for mobile communications", by H. Harada and R. Prasad, Artech House Publishers, 2002.

4. "Fundamentals of Wireless Communication", by David Tse and Pramod Viswanath, Cambridge University Press, 2005.

5. "Digital Communications", by J. Proakis, 5th edition, McGraw Hill, 2008.

6. "OFDM and MC-CDMA for Broadband Multi-User Communications, WLANs and Broadcasting", by L. Hanzo, M. Munster, B. Choi and T. Keller, IEEE Press and Wiley, 2003.

Major C.   Network Oriented Systems

1st Semester

Course Code:	ΨΣ-ΔΚ-501
Course Title:	Web Programming and Applications
Type of Course:	Compulsory
Year of Study/ Semester:	1st/1st
ECTS Credits:	7,5
Faculty:	C. Doulkeridis, Adjunct Lecturer

Objective

This course focuses on technologies for Web application development. More specifically, techniques for developing dynamic websites using PHP are presented, and the communication of PHP web applications with data storage systems. Furthermore, the course presents key issues in managing XML information, such as the structure of XML documents, querying XML documents, XML transformations, web programming with XML, and development of web applications that interact with stored XML documents.

Course Contents

Introduction to the development of dynamic web applications with PHP. Structure of PHP language (variables, data types, arrays, conditional structures, functions). Web application development with web forms and file management. PHP application development with database connectivity. Introduction to XML. Basic structure of XML documents, valid XML documents, DTD, XML Schema. Querying XML documents – XPath and XQuery. Development of dynamically transformed webpages with XSL and XSLT. XML documents with data binding and Document Object Model (DOM). Web application development with XML storage.

Recommended Reading

1. Anders Moller and Michael I. Schwartzbach (2006), An Introduction to XML and Web Technologies, Addison-Wesley, 568pp.

2. Larry Ullman (2008), PHP for the World Wide Web, Third Edition, ISBN: 0321442490.

3. Julie Meloni (2006), Sams Teach Yourself PHP, MySQL and Apache All in One, Third Edition, ISBN: 0672328739.

4. Luke Welling & Laura Thomson (2001), PHP & MySQL Web Development, ISBN: 0672317842.

5. Young, M. (2002). XML Step-by-Step, Second Edition, ISBN: 0735614652.

Course Code:	ΨΣ-ΔΚ-502
Course Title:	Advanced Information Systems
Type of Course:	Compulsory
Year of Study/ Semester:	1st/1st
ECTS Credits:	7,5
Faculty:	G.Vassilacopoulos, Professor

Objective

Human beings have the distinct ability to attach meaning to whatever they perceive. The data translation to information and attempt, in an organized manner to provide information so as to getting action, constitute the basis of the principle "information system". In this course, the notion of an information system in the context of an organisation is defined and particular emphasis is placed on the fact that an information system is essentially a special type of system which produces processes and distributes information to the appropriate receivers using a digital technology as a tool. Professionals in the field of information systems basically work on a) information generation from computers with the goal to aid the organization to define and achieve its goals, and b) the realization or improvement of processes of the organization with the use of appropriate digital technology. Thus, professionals of the field of information systems should be able to understand both the technological and the organizational factors, and must be able to help organization to determine how information and automated entrepreneurial processes can provide comparative advantages. These professionals play important role in determining the requirements for an information system of the organization and they participate actively in its specification, design and realization. Therefore, they must have deep knowledge of state-of-the-art digital technologies and must be acquainted with the organizational principles and practices so that they contribute decisively in provisioning the systems and information that organization needs for supporting its operations. Furthermore these professionals determine the processes of evolution of information systems in order for novel comparative assets to be achieved for the organization through interoperability of existing systems themselves and the capitalization from the use state-of-the art digital technology, with parallel assurance of its earlier investments. In the context of the class particular emphasis will be given to the development of information systems for simulated realistic environments with the creation of state-of-the-art architectures that are based on the World Wide Web. In particular there will be developments of systems with the use of state-of-the-art process-oriented and service-oriented technologies.

Course Contents

Principles of system analysis. Human activity systems. Information systems: approaches and frameworks. The organization as reference framework for the development of information systems. Information systems, administration and business strategy. Human-centric and participatory development of information systems. Business process management. Network-oriented information systems. Life cycles of information systems. Organizational replanning aided by information systems. Operational value and service management. Service-oriented architectures of information systems. Information system security.

Recommended Reading

1. Vassilacopoulos G. (2009): Information Systems (in greek).

2. Laudon K.C. and Laudon J.P. Management Information Systems – Managing the digital firm. Pearson, 2006.

3. O' Brien J.A. Management Information Systems – Managing information technology in the business enterprise. McGraw-Hill, 2004.

4. Checkland P. and Holwell S. Information, Systems and Information Systems – Making sense of the field. Wiley, 2002.

Course Code:	ΨΣ-ΔΚ-301
Course Title:	Computer Networks
Type of Course:	Compulsory
Year of Study/ Semester:	1st/1st
ECTS Credits:	7,5
Faculty:	A. Rouskas, Assistant Professor

Objective

The main objective of the course is the presentation of modern computer networking protocols and architectures. The course spans the entire protocol layer stack with particular emphasis on data link, network and transport layers. The students will work on a small project in a relative computer networking subject.

Course Contents

Overview of access network and core network technologies. Data link layer protocols. Wireline and wireless MAC protocols. Network layer. IP addressing, routing protocols and algorithms. Routing protocols and algorithms. Examples/exercises. IP multicasting. Transport layer protocols, TCP, UDP. IP QoS. QoS architectures and protocols (Diffserv, IntServ). Multiprotocol label switching (MPLS). Computer networks simulation tools ns2/ns3. Socket Programming – development of application layer protocols.

Recommended Reading

1. Computer Networks: A Systems Approach, third edition, by Larry Peterson and Bruce Davie.

2. Computer Networking: A Top-Down Approach Featuring the Internet, 3rd edition, by James F. Kurose and Keith W. Ross.

3. TCP/IP Illustrated, Volume 1: The Protocols by W. Richard Stevens.

4. Unix Network Programming: Networking APIs: Sockets and XTI (Volume 1) by W. Richard Stevens.

5. Advanced Programming in the Unix Environment by W. Richard Stevens, Addison-Wesley, 1993.

Course Code:	ΨΣ-ΔΚ-503
Course Title:	Systems Development Methodologies
Type of Course:	Compulsory
Year of Study/ Semester:	1st /1st
ECTS Credits:	7,5
Faculty:	A. Prentza, Assistant Professor

Objective

The course seeks to familiarize students with the concepts of Systems Analysis and Design methodologies, UML syntax and semantics, and the relative aspects of the Rational Unified Process. The course takes place in a lab setting. Teaching consists of the presentation of the different UML diagrams illustrated using different specific examples. Students get a project and have to produce the design of a system following a specific methodology.

Course Contents

Introduction to system development methodologies. Introduction to UML, the role and value of UML in projects, the object-oriented paradigm and its relation to UML, an integrated approach to UML diagrams, UML tools. Use case models and diagrams. Class diagrams, Object diagrams. Interaction diagrams (Sequence and communication diagrams). State diagrams. Activity diagrams. Component and deployment diagrams. Rational Unified Process (RUP). Agile development method / SCRUM.

Recommended Reading

1. Grady Booch, James Rumbaugh, Ivar Jacobson (2005), Unified Modeling Language User Guide by, Publisher Addison-Wesley Professional, 2nd Edition.
2. Dan Pilone, Neil Pitman (2005), UML 2.0 in a Nutshell by, Publisher O'Reilly Media, 2nd Edition.
3. Martin Fowler (2003), UML Distilled: A Brief Guide to the Standard Object Modeling Language, 3rd Edition.
4. Ian Sommerville (2010), Software Engineering, publisher Addison Wesley, 9th Edition.

2nd Semester

Course Code:	ΨΣ-ΔΚ-504
Course Title:	Data management
Type of Course:	Compulsory
Year of Study/ Semester:	1st /2nd
ECTS Credits:	7,5
Faculty:	G. Vassilacopoulos, Professor M. Halkidi, Lecturer C. Doulkeridis, Adjunct Lecturer

Objective

The aim of this course is to introduce the students to the principles of the Database Management System (DBMS) and data mining. It covers issues related to the database design, different architectures of database management systems as well as advanced query processing methods. It also presents the main concepts of knowledge discovery and data mining for voluminous data collections.

Course Contents

Introduction to Database design-Life cycle of databases. Conceptual and Logical Database design. Entity relationship model, Relational Model – Database normalization. Distributed and parallel data management (applications to per-to-peer systems, mobile systems, sensor networks, cloud computing). Spatial data management (indexing, query processing, multidimensional data). Rank-aware query processing (top-k, rank join, skyline queries). Web data management- Semi-structured data. Introduction to Data mining: Fundamental concepts and methods. Unsupervised and semi-supervised learning. Gaussian Mixture models, EM algorithm, MPCKMeans, Kernel methods. Supervised learning techniques. SVM, Decision trees, Naive Bayes Classifier, k-nn). Web mining: Link Analysis, Web Search, Page ranking algorithms.

Recommended Reading

1. Raghu Ramakrishnan and Johannes E. Gehrke. Database Management Systems. McGraw Hill, 2002.

2. Silberschatz, Korth, Suda. Database System Concepts (Fifth Edition). McGraw-Hill, 2005.

3. Elmasri and Navathe. Fundamentals of Database Systems. Addison-Wesley, 5th Edition, 2007.

4. J. Han and M. Kamber (2006). Data Mining: Concepts and Techniques. Morgan Kaufmann.

5. Soumen Chakrabarti(2002). Mining the Web, Discovering Knowledge from Hypertext Data, Morgan Kaufman Publishers.

6. David Hand, Heikki Mannila, and Padhraic Smyth (2001). Principles of Data Mining, MIT Press.

7. Trevor Hastie, Robert Tibshirani, Jerome Friedman (2003). The Elements of Statistical Learning Theory, Data Mining, Inference and Prediction, Springer Verlag.

8. M. Vazirgiannis, M. Halkidi and D. Gunopoulos. Quality Assessment and Uncertainty Handling in Data Mining, Springer Verlag, LNAI Series.

9. Tom Mitchell (1997). Machine Learning, McGraw Hill.

Course Code:	ΨΣ-ΔΚ-302
Course Title:	Computer Networks Design and Management
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	P. Demestichas, Associate Professor

Objective

The course "Design and Management of Computer Networks" aims at teaching the contemporary methodologies and technologies in the areas of design and management of computer networks. In this context, network design problems are presented and properly formulated, whereas algorithms for their solution are presented, developed and validated using commercial software packages. Furthermore, the fundaments of

computer network management, with respect to functional, information and communication models, are presented, thoroughly discussed and validated. The course is in general comprised of both theoretical lectures and specialised laboratory and programming exercises and platform demonstrations.

Course Contents

Introduction: Course overview. Overview of computer networks. Modern computer networks. Wireless and wired access. Core networks. General presentation of computer network design, control and management problems. Wireline network design problems. Packet switching, circuit switching. IP access via DSL, LAN, optical systems. Core network design problems, Ethernet WANs, optical technologies. Wireless access network design problems. The cases of TDMA, CDMA and OFDMA for 2G, 3G, LTE, Femtocells, IEEE 802.x technologies, heterogeneous infrastructures. Radio resource management. Spectrum and power management. Network element topology problems. Interconnection with backhaul/core networks. Methods and Algorithms for solving computer network design problems: local search, greedy, (meta-)heuristics, simulated annealing, genetic algorithms, taboo search, neural networks, other bio-inspired and learning techniques. Application to the above network design problems. Programming exercises. Introduction to network management. CFAPS functionalities. Network Management levels. Manager, Agents. Management Information Base (MIB). Management of IP-based networks. SNMP protocol. SMI, ASN.1. MIB design and realization for network elements. Management based on the SNMP Protocol. MIBs content processing. Laboratory exercises. Design and Implementation of management applications based on the SNMP Protocol. MIBs content processing. Laboratory exercises. Management platform and tools. Demonstration and use of platforms and tools used today for monitoring, management and control of computer networks: HP Openview, SNMPc, MRTG. Modern methodologies and trends in computer network management: Self-*, Self-management, autonomic management, cognitive management, web-based management, policy based management, network governance.

Recommended Reading

1. D. Bertsekas, "Network Optimization: Continuous and Discrete Models", Athena Scientific, 1998.

2. D. Bertsekas, "Dynamic Programming and Optimal Control", Vols. I and II, Athena Scientific, 1995, (3rd Edition Vol. I, 2005, 2nd Edition Vol. II, 2001).

3. D. Bertsekas, R. Gallagher, "Data Networks ", Prentice-Hall, 1987 (2nd Ed. 1991).

4. D. Bertsekas, "Linear Network Optimisation, Algorithms and Codes", MIT Press, 1991.

5. Leinwand, K. Fang, "Network management a practical perspective", Addison-Wesley Inc.

6. Stallings W., "SNMP, SNMPv2 and CMIP: The practical guide to network management standards", Addison-Wesley Inc.

7. D. R. Mauro and K. J. Schmidt, Essential SNMP, O'Reilly, 2nd Edition, September 2005.

8. SNMP RFCs, available at http://www.snmp.com/protocol/snmp_rfcs.shtml.

9. Integrated Management of Networked Systems: Concepts, Architectures, and Their Operational Application (The Morgan Kaufmann Series in Networking), Heinz-Gerd Hegering, Sebastian Abeck, and Bernhard Neumair, 1999.

10. Andrew Tanenbaum, "Computer Networks".

11. James Kurose, Keith Ross, "Computer Networking: A Top-Down Approach Featuring the Internet".

12. Jean Walrand, "High Speed Networks".

13. Jean Walrand, "Computer Networks: A First Course".

14. Travis Russell, "Telecommunications Protocols".

Course Code:	ΨΣ-ΔΚ-505
Course Title:	Business Process Management
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	M. Themistocleous, Assistant Professor

Objective

The rapid changes in the business environment increase the need for agile and flexible organisations. Business agility and flexibility can be effectively achieved, when organisations understand and manage their business processes. Business Process Management (BPM) is an approach focused on aligning the business strategy and all aspects of an organisation with the needs of customers. The course seeks to investigate and analyse issues related to BPM and explore advanced topics in this area.

Course Contents

Introduction to business processes, process architectures and process methodologies. Business Process Change: Analysis, improvement, redesign, innovation, and process management. Six Sigma. BPM Lifecycle. Business Strategy, BPM and stakeholders management. Rules, Restrictions, Exceptions, Business Logic, Fault handling. BPM and Work Flow Management. Software tools for BPM and Work Flow (Lab session). BPM and SOA. BPEL, Orchestration and Choreography.

Recommended Reading

1. Jeston, J. and Nelis, J., (2008), 'Business Process Management, Second Edition: Practical Guidelines to Successful Implementations', Elsevier - BH, London, UK.

2. Fiammante, M., (2009), 'Dynamic SOA and BPM: Best Practices for Business Process Management and SOA Agility', IBM Press, USA.

Course Code:	ΨΣ-ΔΚ-506
Course Title:	Network Programming
Type of Course:	Compulsory
Year of Study/ Semester:	1st /2nd
ECTS Credits:	7,5
Faculty:	N. Sgouros, Professor

Objective

The goal of this course is to familiarize students with the basic principles of programming network applications using the Java programming language. The course consists of laboratory sessions. More specifically, the course presents the basic programming techniques for the implementation of various internet applications while describing the main features of programming code that implements the specific applications. The students must then work on extending/upgrading/modifying the given code.

Course Contents

Complex & Polymorphic Data Types. Event-driven Programming. User Interface Development using the Java Swing library. Thread Programming. I/O streams. Socket programming. Client/Server implementation. Remote procedure call (Java RMI). Development of a Prototype Implementation. Efficiency of Applications.

Recommended Reading

1. W. Richard Stevens, "UNIX NETWORK PROGRAMMING (VOL. 1: Networking APIs: Sockets and XTI)", Prentice Hall 1998.

2. W. Richard Stevens, "UNIX NETWORK PROGRAMMING (VOL. 2: Interprocess Communications)", Prentice Hall 1999.

3. "UNIX Network Programming, Volume 2: Interprocess Communications", W. Richard Stevens, Prentice Hall, 2nd edition, 1998.

4. "Client/Server Survival Guide", Robert Orfali, Dan Harkey, and Jeri Edwards 3rd Edition, Wiley.

5. Java Tutorials (http://download.oracle.com/javase/tutorial/).

3rd Semester

Course Code:	ΨΣ-ΔΚ-801
Course Title:	Network-Oriented Systems Security
Type of Course:	Compulsory
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	K. Lambrinoudakis, Assistant Professor C. Xenakis, Lecturer

Objective

The main objective of this lesson is to study and analyze the security issues encountered in networked systems. It focuses on wired networks, which are based on the Internet technology, that provide computer communications and networked services.

Course Contents

Introduction to Communications and Networks Security. Basic issues in Cryptography. Public Key Infrastructure. Key Agreement, Key management, Digital certificates and Digital Signatures. Firewalls. Virtual Private Networks and Web Security. Authentication and Privacy. Attacks in Privacy and Privacy Requirements. Non Linkability, Non Detectability, and Non Traceability. Privacy Enhancing Techniques.

Recommended Reading

1. William Stallings, (2007): Network Security Essentials: Applications and Standards, 3/E, Publisher: Prentice Hall.

2. John R. Vacca, (2009): Computer and Information Security Handbook, Publisher: Morgan Kaufmann Publishers, Elsevier.

Course Code:	ΨΣ-ΔΚ-507
Course Title:	Network-Oriented Systems Applications
Type of Course:	Compulsory
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	M. Themistocleous, Assistant Professor, V. Stavroulaki, Assistant Professor E.Loukis

Objective

Net-centric applications and systems are significant for many sectors including healthcare, public administration, finance etc. This course focuses on the practical study of fundamental net-centric applications currently used by organizations such as ERP, CRM, SCM, BI systems. Cloud computing and mobile terminals applications will also be studied. Thereby, the course will support students' transition from the academia to the business environment.

Course Contents

Introduction to Net-centric Applications. ERP and Financial Management. ERP: Sales and Stocks Management. Customer Relations Management System (CRM): Strategy, Life Cycle and CRM tools. Business Intelligence (BI): Theoretical Background and BI Software. Supply Chain Management (SCM) and Strategic Management. SCM modules, tools and e-SCM. Services cloud (Cloud Computing) and Networked Systems. Applications for Mobile Terminals. Applications for Mobile Terminals.

Recommended Reading

1. Monk, E., Wagner, B. (2007), 'Concerns in Enterprise Resource Planning', Thomson Course Technology, USA.

2. Greenberg, P. (2009), 'CRM at the Speed of Light: Social CRM 2.0 Strategies, Tools, and Techniques for Engaging Your Customers ', McGraw-Hill, NY USA.

Course Code:	ΨΣ-ΔΚ-508
Course Title:	Network-Oriented Systems Governance
Type of Course:	Compulsory
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	G.Vassilacopoulos, Professor M. Themistrocleous, Assistant Professor

Objective

Students attending this course will be able to understand, key issues related to the nature of Management of Information Systems (MIS). MIS deals with various decisions related to IS procurement, adoption, evaluation, management etc that need to be taken. Particular emphasis is given on case studies analysis.

Course Contents

Conception and Design. Cost and ROI. Tender and Tender lifecycle. Insourcing and Outsourcing. Resource Allocation. IS Adoption and TAM model. IS Evaluation. Success and Failure. Change Management. Risk Management. IS Governance. SOA Governance.

Recommended Reading

1. Oz, E. (2009), 'Management Information Systems', Thomson, USA.

2. Laudon, K. and Laudon, J. (2009), 'Management Information Systems – Managing the Digital Firm', Prentice Hall, USA.

Course Code:	ΨΣ-ΔΚ-509
Course Title:	Service Oriented Architectures
Type of Course:	Compulsory
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	M. Themistocleous, Assistant Professor C. Doulkeridis, Adjunct Lecturer

Objective

The course aims at analyzing and using Service Oriented Architectures (SOA) and technologies to integrate IT infrastructures. In this context special emphasis will be given on web services and SOA. Upon completion this course, students will be able to implement service oriented systems and architectures.

Course Contents

Introduction to Service Oriented Architectures (SOA) and Systems. Service Oriented Architectures. SOA Lifecycle and Development Methodologies. Web Services Lifecycle. Web Services and QoS. XML and SOAP. WSDL and UDDI. Workshop on SOA tools. Orchestration and Choreography. BPEL.

Recommended Reading

1. Papazoglou, M. P. (2008): 'Web Services: Principles and Technology', Pearson, Pentice Hall, London, UK.

2. Themistocleous, M., Mantzana, V. (2010): 'Web Services and SOA', Athens Greece.

2.5.3 Postgraduate Programme in "Techno-economics Management and Digital Systems Security"

No.	Title	Year of Study/ Semester	ECTS	Credits
Major A.	**Techno-economics Management**			
ΨΣ-ΤΔ-320	Advanced Telecommunication Technologies	1st/ 1st		7,5
ΨΣ-ΤΔ-501	Network-Oriented Systems and Services	1st/ 1st		7,5
ΨΣ-ΤΔ-902	Managerial Accounting	1st/ 1st		7,5
ΨΣ-ΤΔ-901	Business, Regulatory and Legal Framework of Telecommunication Networks and Services	1st/ 1st		7,5
ΨΣ-ΤΔ-903	Strategic Management of Telecommunication Companies	1st / 2nd		7,5
ΨΣ-ΤΔ-502	Advanced Information Systems	1st / 2nd		7,5
ΨΣ-ΤΔ-904	Project Management	1st / 2nd		7,5
ΨΣ-ΤΔ-905	Managerial Finance	1st / 2nd		7,5
ΨΣ-ΤΔ-906	Telecommunication Product and Services Marketing	2nd/ 3rd		7,5
ΨΣ-ΤΔ-321	Management of Telecommunication Networks and Services	2nd/ 3rd		7,5
ΨΣ-ΤΔ-907	Innovation and Technology Management	2nd/ 3rd		7,5
ΨΣ-ΤΔ-908	Consulting Services	2nd/ 3rd		7,5
ΨΣ-ΤΔ-999	Master Thesis	2nd / 3rd		15
Major B.	**Digital Systems Security**			
ΨΣ-ΑΦ-801	Security Principles and Foundations	1st/ 1st		7,5
ΨΣ-ΑΦ-802	Network and Web Services Security	1st/ 1st		7,5
ΨΣ-ΑΦ-803	Advanced Security, Trust and Privacy Preserving Services	1st/ 1st		7,5
ΨΣ-ΑΦ-804	Cryptography	1st/ 1st		7,5
ΨΣ-ΑΦ-805	Information Systems Security	1st/ 2nd		7,5
ΨΣ-ΑΦ-806	Next Generation Mobile and Wireless Networks Security	1st/ 2nd		7,5
ΨΣ-ΑΦ-807	Security Policies and Management	1st/ 2nd		7,5
ΨΣ-ΑΦ-808	Trust, Security and Privacy Enhancing Technologies	1st/ 2nd		7,5
ΨΣ-ΑΦ-809	Secure Software for Advanced Services	2nd / 3rd		7,5

No.	Title	Year of Study/ Semester	ECTS Credits
ΨΣ-ΑΦ-810	Socio-Economical Aspects of Security	2nd / 3rd	7,5
ΨΣ-ΑΦ-811	Digital Services Security	2nd / 3rd	7,5
ΨΣ-ΑΦ-812	Applied Security Services and Solutions	2nd / 3rd	7,5
ΨΣ-ΑΦ-888	Master Thesis	2nd /3rd	15

2.5.4 Postgraduate Programme in "Techno-economics Management and Digital Systems Security" - Individual Course Description

Major A. Techno-economics Management

1st Semester

Course Code:	ΨΣ-ΤΔ-320
Course Title:	Advanced Telecommunication Technologies
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 1st
ECTS Credits:	7,5
Faculty:	P. Demestichas, Associate Professor
	A. Rouskas, Assistant Professor
	A. Alexiou, Assistant Professor
	K. Tsagkaris, Adjunct Lecturer

Objective

The course "Advanced Telecommunication Technologies" is about going into the structure and principles of the modern telecommunication technologies. It covers wired and wireless access and core network technologies, and paves the way in better comprehending the evolution towards Future Networks.

Course Contents

Introduction to Advanced Telecommunication Technologies. Wireless access systems, physical layer, 2G/2.5G/3G mobile technologies. Wireless access systems, physical layer, 3.5G/4G mobile technologies. Wireless access systems, physical layer, WLAN, WMAN, WPAN. Wireless access networks, 2G technologies. Wireless access networks, 3G technologies. Wireless access networks, IMT-advanced technologies, Internet Technologies. Core technologies, wired access technologies (DSL, LAN, FTTx). Wireless internet technologies, Wireless TCP. Future Internet – Advanced management techniques.

Recommended Reading

1. Andrew Tanenbaum, "Computer Networks".

2. James Kurose, Keith Ross, "Computer Networking: A Top-Down Approach Featuring the Internet.

3. Jean Walrand, "High Speed Networks".

4. Jean Walrand, "Computer Networks: A First Course".

5. Travis Russell, "Telecommunications Protocols". Jean Walrand, "High Speed Networks".

6. Jean Walrand, "Computer Networks: A First Course".

7. Travis Russell, "Telecommunications Protocols".

Course Code:	ΨΣ-ΤΔ-501
Course Title:	Network-Oriented Systems and Services
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 1st
ECTS Credits:	7.5
Faculty:	G. Vassilacopoulos, Professor
	V. Stavroulaki, Assistant Professor
	C. Doulkeridis, Adjunct Lecturer

Objective

The objective of this course is to provide an overview of issues and technical challenges in the area of net-centric systems and services in which a lot of research effort is being devoted. The course introduces students to the basic concepts of net-centric systems and services and places particular emphasis on their techno-economic aspects. In this context, cost-benefit analysis and relevant project portfolio investment criteria are addressed and analyzed. Among the technologies addressed the following are included: business process management (BPM), service-oriented architectures, pervasive and ubiquitous computing, context-aware computing, smart places, ERP systems and cloud computing. Several applications of net-centric systems and services, emphasizing these technologies, in areas of current international interest such as e-government, e-business and e-health are also presented.

Course Contents

Basic concepts, advantages & disadvantages of net-centric systems and services, criteria for the investment in relevant technologies, acceptance management, change management. E-services focusing on e-procurement, e-government, e-health, e-prescribing. Business process management, service-oriented architectures, web-services. Ubiquitous, pervasive systems (1): Main concepts, advantages-disadvantages, evaluation. Ubiquitous, pervasive systems (2): Relevant technologies and benefits, context-awareness, smart phones, sensor networks. Ubiquitous, pervasive systems (3): Applications on smart spaces, smart homes, smart offices. ERP Systems (1): Introduction, objectives, operations, services provision, benefits. ERP Systems (2): Case studies, example applications. Cloud computing (1): Basic concepts, new service provisioning model, pay-per-use. Cloud computing (2): Software-as-a-Service (SaaS), Hardware-as-a-Service (HaaS), Platform-as-a-Service (PaaS).

Recommended Reading

1. M. Weiser, "The Computer for the 21st Century", Scientific American, Sept. 1991.

2. M. Satyanarayanan, "Pervasive Computing: Vision and Challenges", IEEE Personal Communications, 1991, p.p. 10-17, http://www-2.cs.cmu.edu/~aura/docdir/pcs01.pdf.

3. IEEE Pervasive Computing http://www.computer.org/portal/web/pervasive/.

4. Sachin G., Pervasive Computing Reading List http://www.cs.utah.edu/~sgoyal/pervasive/.

5. IBM Research Autonomic Computing, http://www.research.ibm.com/autonomic/.

6. IERC-European Research Cluster on the Internet of Things, http://www.internet-of-things-research.eu/.

7. European Future Internet portal, http://www.future-internet.eu/.

8. Thomas H.Davenport, "Putting the Enterprise into the Enterprise System", Harvard Business Review, Vol.76, Issue 4, 1998.

9. IEEE Data Engineering Bulletin, Data Management on Cloud Computing Platforms, Volume 32, Number 1, March 2009.

10. Linthicum D.S. Cloud Computing and SOA Convergence in Your Enterprise, Addison-Wesley, 2010.

11. Kanagasingam Y, Lodewijk B., Brett P. and Gibbons M.S. Handbook of Digital Homecare, Springer, 2007.

12. Holt J. A Pragmatic Guide to Business Process Management. 2nd Edition, BCS, 2009.

13. Smith S.P. and Flarey D.L. Process-Centered Health Care Organizations. Aspen, 1999.

14. Deitel H.M., Deitel P.J., DuWaldt B. and Trees L.K. Web Services: A Technical Introduction. Prentice-Hall, 2003.

15. Erl T. Service-oriented Architecture: Concepts, Technology and Design. Prentice-Hall, 2005.

Course Code:	ΨΣ-ΤΔ-902
Course Title:	Managerial Accounting
Type of Course:	Compulsory
Year of Study/ Semester:	1st /1st
ECTS Credits:	7,5
Faculty:	G. Artikis

Objective

The course aims to provide information to assist all levels of management in decision making, planning and control business activities.

Course Contents

Accounting statements. Accounts. Company analysis: Ratio analysis. Company analysis: Cash flows. Industry analysis. Economy analysis. Financing principles. Investment cost. Cash flows. Capital budgeting methods.

Recommended Reading

1. Financial Management, Investment Decisions, G. Artikis, Interbooks, 2010.

2. Financial Management, Analysis and Planning, G. Artikis, Interbooks, 2010.

3. Managerial Accounting, Garrison & Noreen, Irwin McGraw-Hill, 11th Edition, 2006.

4. Management Accounting, Ronald Hilton, Irwin McGraw-Hill, 7th Edition, 2008.

Course Code:	ΨΣ-ΤΔ-901
Course Title:	Business, Regulatory and Legal Framework of Telecommunication Networks and Services
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 1st
ECTS Credits:	7,5
Faculty:	A. Kanellos

Objective

The course aims at providing a thorough practical understanding of the business, operational, regulatory, and legal environment of the electronic communications market.

Course Contents

Greek and European regulatory framework of the electronic communications' market. Business models of communications, service and audiovisual content providers. Broadband wire and wireless infrastructures (Fiber to the Home, mobile broadband). Transition to the digital terrestrial television, radio spectrum policies, digital dividend. Legal and technical organisation of modern telecom operators. Introduction to European, corporate and labour law applicable on the sector. Roles of regulatory authorities and standardization bodies. Industrial and intellectual property, e-commerce, electronic signatures, trademarks, domain names. Legal protection of information, computer software, databases. Privacy and personal data protection. Electronic criminality, Computer crime.

Recommended Reading

1. The legal framework of telecommunications,Xiros Athanasiosm,Sakkoulas Ed,2003,ISBN: 960-301-763-9.
2. Law and Internet – legal issues of the Web, Karakostas Ioannis, ISBN 960 -420 -199 -9.
3. www.eett.gr, www.dpa.gr.

2nd Semester

Course Code:	ΨΣ-ΤΔ-903
Course Title:	Strategic Management of Telecommunication Companies
Type of Course:	Compulsory
Year of Study/ Semester:	1st /2nd
ECTS Credits:	7,5
Faculty:	N. Georgopoulos

Objective

Methods for making techno-economical decisions in telecommunication enterprises and organisms.

Course contents

Introductory concepts and Principles of Strategic management. Entrepreneurial Ethics – Social responsibility – Corporate Governing. Detection of external environment of enterprises: Estimation of competition. Detection of

internal environment of enterprises: recognition of competitive advantages. Configuration of strategy: Entrepreneurial or Corporate strategy, Entrepreneurial or Competitive strategy, Functional Strategy. Evaluation and control of strategy. Case studies in telecommunication enterprises and organizations.

Recommended readings

1. Wheelen T., D. Hunger, (2010) 'Strategic Management & Business Policy', Pearson, 2010.

2. Johnson M, Scholes K and Whittington R., 'Exploring Corporate Strategy', Prentice Hall, 8th edition, 2010.

3. Barney Jay, Hesterly William, 'Strategic Management and Competitive Advantage: Concepts and Cases', Prentice Hall,3rd edition, 2010.

4. Lynch Richard, 'Corporate Strategy, Prentice Hall, 5th edition, 2009.

5. Ghemawat Pankaj, 'Strategy and the Business Landscape', Prentice Hall, 3rd edition, 2010.

6. Mintzberg H, Lambel J, Quinn J, Ghoshal S, 'The Strategy Process', 4th edition, 2003.

7. Hunger D and Wheelen T, 'Essentials of Strategic Management', Prentice Hall, 5th edition, 2011.

8. David F, 'Strategic Management Concepts', Prentice Hall, 12th edition 2009.

9. Carpenter Mason, Sanders Gerry, 'Strategic Management: A Dynamic Perspective' Prentice Hall, 2nd edition 2009.

10. Porter M, 'Competitive Strategy', Free Press, 1980.

11. Porter M, 'Competitive Advantage', Free Press 1985.

Course Code:	ΨΣ-ΤΔ-502
Course Title:	Advanced Information Systems
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	G. Vassilacopoulos, Professor

Objective

Human beings have the distinct ability to attach meaning to whatever they perceive. The data translation to information and attempt, in an organized manner to provide information so as to getting action, constitute the basis of the principle "information system". In this course, the notion of an information system in the context of an organisation is defined and particular emphasis is placed on the fact that an information system is essentially a special type of system which produces processes and distributes information to the appropriate receivers using a digital technology as a tool. Professionals in the field of information systems basically work on a) information generation from computers with the goal to aid the organization to define and achieve its goals, and b) the realization or improvement of processes of the organization with the use of appropriate digital technology. Thus, professionals of the field of information systems should be able to understand both the technological and the organizational factors, and must be able to help organization to determine how information and automated entrepreneurial processes can provide comparative advantages. These professionals play important role in determining the requirements for an information system of the organization and they participate actively in its specification, design and realization. Therefore, they must have deep knowledge of state-of-the-art digital technologies and must be acquainted with the organizational principles and practices so that they contribute decisively in provisioning the systems and information that

organization needs for supporting its operations. Furthermore these professionals determine the processes of evolution of information systems in order for novel comparative assets to be achieved for the organization through interoperability of existing systems themselves and the capitalization from the use state-of-the art digital technology, with parallel assurance of its earlier investments. In the context of the class particular emphasis will be given to the development of information systems for simulated realistic environments with the creation of state-of-the-art architectures that are based on the World Wide Web. In particular there will be developments of systems with the use of state-of-the-art process-oriented and service-oriented technologies.

Course Contents

Principles of system analysis. Human activity systems. Information systems: approaches and frameworks. The organization as reference framework for the development of information systems. Information systems, administration and business strategy. Human-centric and participatory development of information systems. Business process management. Network-oriented information systems. Life cycles of information systems. Organizational replanning aided by information systems. Operational value and service management. Service-oriented architectures of information systems. Information system security.

Recommended Reading

1. Γ. Βασιλακόπουλος. Πληροφοριακά Συστήματα, 2009.

2. Laudon K.C. and Laudon J.P. Management Information Systems – Managing the digital firm. Pearson, 2006.

3. O' Brien J.A. Management Information Systems – Managing information technology in the business enterprise. McGraw-Hill, 2004.

4. Checkland P. and Holwell S. Information, Systems and Information Systems – Making sense of the field. Wiley, 2002.

Course Code:	ΨΣ-ΤΔ-904
Course Title:	Project Management
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	F. Malamateniou, Assistant Professor M. Themistocleous, Assistant Professor

Objective

The main objectives of the course are to introduce the main concepts of project management, emphasizing project management of digital systems, to study generally recognized, good project management practices, such as the ones included in the Project Management Body of Knowledge (PMBOK) of the Project Management Institute (PMI), and to use such practices in project management of digital (information and telecommunication) systems.

Course Contents

Introduction to project management (e.g. project definition, projects typology, triple constraint concept, a systems approach to project management, organizational influences). Project information systems and services life cycles. Project Management methodologies (e.g. PMI). Business cases of information technology projects

(e.g. Measurable organizational value, feasibility study, Return on Investment, Cost Benefit Analysis). Development of project charters and project plans. Project Time and Recourse Management (e.g. Work Breakdown Structure, Project organization structure and responsibilities, Gantt charts, the critical path, network diagramming, PDM networks, CPM/PERT, Scheduling with resource constraints). Project estimation (e.g. Delphi technique, Time boxing). Software engineering metrics and approaches (e.g. Lines of Codes, Function point analysis, COCOMO). Cost estimating and budgeting (e.g. cost estimating process, elements of budgets and estimates, budgeting using cost accounts). Project Control (e.g. the control process, traditional cost control, cost accounting systems for project control, project control process, performance analysis). Laboratory exercises using MS Project. Laboratory exercises using MS Project. Laboratory exercises using MS Project.

Recommended Reading

1. PMI Corporate authors, 2008, A Guide to the Project Management Body of Knowledge: (PMBOK Guide).

2. J. Reed, 2008, Project Management with PRINCE2 Best Practice Handbook: Building, Running and Managing Effective Project Management - Ready to use supporting documents bringing PRINCE2 Theory into Practice.

3. Jack. T. Marchewka, Information Technology Project Management: Providing Measurable Organizational Value, 2006, Wiley.

4. John. M. Nicholas, Project Management for Business and Engineering: Principles and Practice, 2004, Elsevier Inc.

Course Code:	ΨΣ-ΤΔ-905
Course Title:	Managerial Finance
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	G. Artikis

Objective

The course aims to provide information to assist all levels of management in decision making, planning and control business activities.

Course Contents

Stock capital. Dividend policy. Leasing. Bond loans. Cost of loans. Cost of preferred stocks. Cost of reverses. Weighted average cost of capital. Fundamental valuation.

Recommended Reading

1. Finacial Management, Financing Decisions, G. Artikis, Interbooks, 2010.

2. Brealey, Richard A., Stewart C. Myers, and Alan J. Marcus, Fundamentals of Corporate Finance, McGraw-Hill, Fourth Edition, International Edition, 2004.

3. Van Horne, James C., and Wachowicz, John M. JR, Financial Management, Twelfth Edition, Financial Times Prentice Hall, England, 2005.

3rd Semester

Course Code:	ΨΣ-ΤΔ-906
Course Title:	Telecommunication Product and Services Marketing
Type of Course:	Optional
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	A.Kouremenos

Objective

State-of-the-art practices for the promotion of products (technologies) and services in competitive environments.

Course Contents

Introduction to Marketing. Concept of Price, Product, Place and Promotion. Sales Administration. Communication strategy. Case studies in Communication enterprises and organizations. Project assignment to groups of students: Cost accounting and Promotion of Telecommunication products and services in simulated markets based on marketing strategies. Theory, Exercises, Projects.

Recommended Reading

1. On the Move to Meaningful Internet Systems 2008, 2008, Springer-Verlag Berlin and Heidelberg GmbH & Co. KG, ISBN: 3540888705.

Course Code:	ΨΣ-ΤΔ-321
Course Title:	Management of Telecommunication Networks and Services
Type of Course:	Optional
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	P. Demestichas, Associate Professor
	K. Tsagkaris, Adjunct Lecturer

Objective

The course "Management of Telecommunication Networks and Services" aims at teaching the contemporary methodologies and technologies in the areas of design and management of telecommunication networks and provided services. In this context, network an service design problems are presented and properly formulated, whereas algorithms for their solution are presented and developed using commercial software packages. Furthermore, the fundaments of telecommunication networks management, with respect to functional, information and communication models, are presented, thoroughly discussed and validated. The course is in general comprised of both theoretical lectures and specialized laboratory exercises and platform demonstrations.

Course Contents

Introduction: Course overview. Overview of management of telecommunication networks and services. Presentation of general problems in the telecommunication network design, management and control. Design of telecommunication networks: Design of wireless and fixed access networks based an techno-economic factors. Methods aiming at maximizing the provided Quality of Service (QoS) levels, while minimizing telecommunication costs. Algorithms for the design of telecommunication networks: Basic theory in network design. Algorithms for the solution of telecommunication network design problems: greedy, simulated annealing, genetic algorithms, taboo search, neural networks and learning techniques. Programming exercises. SNMP protocol (Managers, Agents, MIBs): MIB Design and development for telecommunication network elements. SNPM-based management. MIB processing. Laboratory exercises. Design and development SNMP-based management applications. Management platform and tools: Demonstration and use of platforms and tools used by today telco operators for monitoring, management and control of their networks and services. HP Openview, SNMPc, MRTG. Modern methodologies and trends in telecommunication network management: Self-*, Self-management, autonomic management, cognitive management, policy based management, network governance.

Recommended Reading

1. D. Bertsekas, "Network Optimization: Continuous and Discrete Models", Athena Scientific, 1998.

2. D. Bertsekas, "Dynamic Programming and Optimal Control", Vols. I and II, Athena Scientific, 1995, (3rd Edition Vol. I, 2005, 2nd Edition Vol. II, 2001).

3. D. Bertsekas, R. Gallagher, "Data Networks ", Prentice-Hall, 1987 (2nd Ed. 1991).

4. D. Bertsekas, "Linear Network Optimisation, Algorithms and Codes", MIT Press, 1991.

5. Leinwand, K. Fang, "Network management a practical perspective", Addison-Wesley Inc.

6. Stallings W., "SNMP, SNMPv2 and CMIP: The practical guide to network management standards", Addison-Wesley Inc.

7. D. R. Mauro and K. J. Schmidt, Essential SNMP, O'Reilly, 2nd Edition, September 2005.

8. SNMP RFCs, available at http://www.snmp.com/protocol/snmp_rfcs.shtml.

9. Integrated Management of Networked Systems: Concepts, Architectures, and Their Operational Application (The Morgan Kaufmann Series in Networking), Heinz-Gerd Hegering, Sebastian Abeck, and Bernhard Neumair, 1999.

10. Andrew Tanenbaum, "Computer Networks".

11. James Kurose, Keith Ross, "Computer Networking: A Top-Down Approach Featuring the Internet".

12. Jean Walrand, "High Speed Networks".

13. Jean Walrand, "Computer Networks: A First Course".

14. Travis Russell, "Telecommunications Protocols".

Course Code:	ΨΣ-ΤΔ-907
Course Title:	Innovation and Technology Management
Type of Course:	Optional
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	G. Yovanof

Objective

The course aims at familiarizing the students with the concepts of innovation, with respect to the technological strategy development and the knowledge acquisition from third parties, in order to connect to and increase the internal innovation procedures. Furthermore, the economics of technological changes is discussed. The general concepts of between innovation and technology, and their management regarding Digital Systems are also examined.

Course Contents

The concepts of innovation and its relation with technology. Examples of innovation in Digital Systems. Innovation process models. Strategy, resources and competition in the context of innovation in Digital Systems. Licensing. Patents. Copyrights.

Recommended Reading

1. Scott Shane "The Handbook of Technology and Innovation Management", Wiley.

2. Robert Burgelman, Clayton Christensen, Steven Wheelwright "Strategic Management of Technology and Innovation".

3. Margaret A. White and Garry D. Bruton "The Management of Technology and Innovation: A Strategic Approach".

Course Code:	ΨΣ-ΤΔ-908
Course Title:	Consulting Services
Type of Course:	Optional
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	F. Paraskeva, Assistant Professor

Objective

This course introduces students to IT- Centric Professional Development based on the demands of institutions and organizational cultures. The course reviews theories and skills necessary for the effective performance in the IT working environment.

Course Contents

This course is an examination of the theories and skills necessary for the development of effective performance on the professional environment in information technology (IT) community. It includes opportunities for evaluating different professional behaviours in a variety of situated contexts. The emphasis is on the success of the IT organizations that may depends on how the people be well prepared to meet the challenges of the changing needs nature of IT contexts. This course is an experience which gives students the opportunity to observe different professional roles in action, by following the needs to grow, to develop and retain as professionals, as well meet the institute s' needs to this direction. Course content includes discussions on professional development programs, ethics, leadership, mentoring, motivations, attitudes, self-efficacy beliefs, e-portfolios etc.

Recommended Reading

1. Robinson, D. & Robinson, J. (2008): Performance Consulting: A practical Guide for HR and Learning Proffesionals, Berrett-Koehler Publishers.

2. Rossett, A. & Sheldon, K. (2001): Beyond the Podium: Delivering Training and Performance to a Digital World, Jossy Bass.

3. Rosenberg, M. (2001): E-Learning Strategies for Delivering Knowledge in the Digital Age, McGraw-Hill.

4. Rossett, Allison & Sheldon, Kendra (2001). Beyond the Podium: Delivering Training and Performance to a Digital World, San Francisco: Jossey-Bass/Pfeiffer.

5. Rummler, G. & Brache, A., (1990). Improving Performance: How to Manage the White Space on the Organization Chart, San Francisco: Jossey-Bass.

6. Giannouleas, M. (2003): Behavior and Interrelationship Communication in working environment, ed. Ellinika Grammata, Athens.

7. Kantas, A. (2000): Organizational and Industrial Psychology, ed. Ellinika Grammata, Athens.

8. Bourandas, D. (2002). Management, ed. Benou.

Major B. Digital Systems Security

1st Semester

Course Code:	ΨΣ-ΑΦ-801
Course Title:	Security Principles and Foundations
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 1st
ECTS Credits:	7,5
Faculty:	C. Lambrinoudakis, Assistant Professor

Objective

The main objective of the course is the familiarization of the students with the terminology and main principles of the Information Systems Security area, thus ensuring a common understanding among the students. Methodologies for analyzing and managing in a systematic way the risk of an information system will be presented in detail, while the main principles for specifying the security policy of an organization will be also discussed.

Course Contents

Information and Communication Systems Security Terminology: Definitions and Principles. Security Requirements. Privacy Requirements. Risk Analysis: Need and Scientific Foundation. Risk Management – Security Countermeasures. The CRAMM Risk Analysis and Management Method. Legal Framework for the protection of personal and sensitive data. Security Policies: Principles, Alternative Approaches, Required Characteristics. Auditing. Security and Privacy Requirements in Service Oriented Systems: Health Information Systems. Electronic Government Systems. Financial sector.

Recommended Reading

1. "Securing Information and Communication Systems: Principles, Technologies and Applications", S. Furnell, S. Katsikas, J. Lopez and A. Patel (Eds.), Artech House, 2008.

2. "Computer Communication Security", W. Ford, Prentice Hall, 1994.

3. "Network Security Essentials: Applications and Standards", W. Stallings, Prentice Hall, 2000.

4. "Internet and Intranet Security", R. Oppliger, Artech House, 2002.

Course Code:	ΨΣ-ΑΦ-802
Course Title:	Network and Web Services Security
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 1st
ECTS Credits:	7,5
Faculty:	C. Xenakis, Assistant Professor

Objective

The main objective of this course is to present and analyze the security issues encountered in computer networks and web services. It focuses on wired networks, based on Internet technology, that facilitate computer communications and networked services.

Course Contents

Security Threats and Attacks. Security Services and Mechanisms. Confidentiality and Cryptography. Public Key Infrastructure. Authenticity Control. Electronic mail security. Network level security. WWW security. Network Management Security. Intrusion Detection Systems. Malicious Software and Intrusions. Firewalls.

Recommended Reading

1. William Stallings, (2007): Network Security Essentials: Applications and Standards, 3/E, Publisher: Prentice Hall.

2. John R. Vacca, (2009): Computer and Information Security Handbook, Publisher: Morgan Kaufmann Publishers, Elsevier.

Course Code:	ΨΣ-ΑΦ-803
Course Title:	Advanced Security, Trust and Privacy Preserving Services
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 1st
ECTS Credits:	7,5
Faculty:	S. Katsikas, Professor

Objective

This course is organized as a series of independent lectures delivered by well established researchers from Greek and other European Universities. The main objective is to present to the students the latest technological and research developments in the area of Information Systems Security and Privacy Protection.

Recommended Reading

1. S. Furnell, S. Katsikas, J. Lopez, A. Patel, (2008): Securing Information and Communications Systems, Principles Technologies and Applications, Artech House.

Course Code:	ΨΣ-ΑΦ-804
Course Title:	Cryptography
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 1st
ECTS Credits:	7,5
Faculty:	D. Lekkas

Objective

The objective of this course is to present the basic concepts of cryptography and its applications in the field of computer science and networking.

Course Contents

Basic terminology and concepts of computer security and cryptography. History of cryptographical systems. Information theory. Transposition Algorithms, Modular Arithmetic. Pseudorandom number generators. Symmetric encryption, Stream ciphers, Block ciphers. DES and 3DES algorithms. Asymmetric encryption principles. RSA algorithm. AES algorithm. Modular Exponentation. Diffie-Hellman key exchange. Hybrid Cryptography. Hash functions, SHA-1 function. Birthday Attack. Steganography. Public Key Infrastructure. Certification Services, Hierarchy, Trust architectures, Added value services. Digital certificates and digital signatures. Use cases: Electronic Passports, Electronic Voting, Electronic Payments.

Recommended Reading

1. B. Schneier. Applied Cryptography. John Wiley & Sons, Inc., 2nd edition, 1996.
2. Menezes, Oorschot, Vanstone, Handbook of Applied Cryptography, CRC, 2001.
3. N. Ferguson, B. Schneier. Practical Cryptography. Wiley, 2003.
4. Mao, W. Modern Cryptography: Theory and Practice. Prentice Hall, 2003.
5. Stinson, D. Cryptography: Theory and Practice. Third Edition, CRC, 2005.
6. John Hershey. Cryptography Demystified. McGraw-Hill Professional, 2003.
7. David. Kahn. The Codebreakers. Scribner, 1996.
8. Simon Singh. The Code Book, The secret history of Codes and Code-Breaking, 1999.

2nd Semester

Course Code:	ΨΣ-ΑΦ-805
Course Title:	Information Systems Security
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	C. Lambrinoudakis, Assistant Professor

Objective

This course enables students to become familiar with technological, procedural and organizational methods that are followed for the provision of basic security characteristics and privacy protection in an information system.

Course Contents

Introduction and Best Practices for addressing Information Systems Security. Elicitation of Security and Privacy Requirements. Operating System Security: Operating System Security parameters and mechanisms. Development of secure operating systems. Identification and authentication: Authentication Categories, Athentication Data, Authentication Systems, Biometric Systems. Access Control: Access Functions, Access Matrix, Access Control Mechanisms. Case studies (Unix, Windows). Hardware Security and Smartcards. The Greek Authentication Framework. Database Security: Security services. Access Control and Authorization. Auditing. Security in object-oriented and distributed Databases. Security in data mining systems. Security assurance and evaluation.

Recommended Reading

1. "Securing Information and Communication Systems: Principles, Technologies and Applications", S. Furnell, S. Katsikas, J. Lopez and A. Patel (Eds.), Artech House, 2008.

2. "Digital Privacy: Theory, Technologies and Practices", A. Acquisti, S. Gritzalis, C. Lambrinoudakis, S. De Capitani di Vimercati (Eds.), Auerbach Publications, 2008.

3. "Wireless Sensor Network Security", J. Lopez and J. Zhou (Eds.), IOS Press, 2008.

4. "Cryptography and Network Security: Principles and Practice", Prentice Hall, 1999.

Course Code:	ΨΣ-ΑΦ-806
Course Title:	Next Generation Mobile and Wireless Networks Security
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	C. Xenakis, Assistant Professor

Objective

The main objective of this course is to study and analyze the security issues encountered in next generation mobile and wireless networks. These networks integrate heterogeneous technologies providing a wide range of

multimedia applications and services to mobile users, independently of their location. Moreover, they realize the concept of Mobile Internet.

Course Contents

Introduction to mobile/wireless networks and security issues in next generation mobile/wireless networks. IEEE 802.11 and IEEE 802.1x. IEEE802.11i and the WEP protocol. TKIP and CCMP protocols. Security in GSM. Security in GPRS. Security in UMTS. Security in WiMAX. Security in 4th generation integrated networks. Security in autonomous wireless environments (MANETs, VANETs, Sensor networks, Mesh networks, etc). Future perspectives and open issues.

Recommended Reading

1. Stefanos Gritzalis, Tom Karygiannis and Charalabos Skianis (editors) (2009): Security and Privacy in Mobile and Wireless Networking, Troubador Publishing Ltd, February 2009.

2. Yan Zhang, Jun Zheng and Miao Ma, (editors): Handbook of Research on Wireless Security, Information Science Reference, February 2008.

Course Code:	ΨΣ-ΑΦ-807
Course Title:	Security Policies and Management
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	D. Gritzalis, Professor
	S. Gritzalis, Professor
	A. Tsochou , Adjunct Lecturer

Objective

The course aims at the analytical presentation and study of the different information security policies and information security management methods. The students will gain specialized knowledge, experience and skills for their application.

Course Contents

Personal Data Protection: The computer scientist's view. Critical Infrastructures Protection. Policies and technical measures for protection against computer viruses. Information security policies and information security management methods. Codes of Conduct. Access Control Policies and Models. Security and authorization Issues in workflow models. Systems availability assurance models. Information Systems Security Assurance and Evaluation: Purpose, Assurance Problems and Methods, Assurance Criteria, Evaluation Frameworks. International Standards on Security: ISO27000 series (Information Security Management Systems). Common Criteria. Standards for Digital Signatures, Key Management, Timestamping. Security Awareness. Business Continuity: Design, Development and Contents of a Business Continuity Plan, Development Phases.

Recommended Reading

1. Furnell, S., Katsikas, S., Lopez, J. & Patel A. (2008): Securing Information and Communication Systems. Principles, Technologies and Applications, Artech House.

2. Acquisti, A., Gritzalis, S., Lambrinoudakis, C., De Capitani di Vimercati S. (2008): Digital Privacy, Theory Technologies and Practices, Auerbach Publications.

3. Summers, R.C. (1997): Secure Computing: Threats and Safeguards, McGraw-Hill.

4. Peltier, T. (1999): Information Security, Policy and Procedures: a Practitioner's Reference, CRC Press LLC.

5. ENISA (2008). A new Users' Guide: How to Raise Information Security Awareness. European Network and Information Security Agency. Available at: http://www.enisa.europa.eu/doc/pdf/deliverables/new_ar_users_guide.pdf.

Course Code:	ΨΣ-ΑΦ-808
Course Title:	Trust, Security and Privacy Enhancing Technologies
Type of Course:	Compulsory
Year of Study/ Semester:	1st / 2nd
ECTS Credits:	7,5
Faculty:	S. Katsikas, Professor

Objective

This course is organized as a series of independent lectures delivered by well established researchers from Greek and other European Universities. The main objective is to present to the students the latest technological and research developments on trust, security and privacy issues in distributed environments that utilize web services. Under this perspective various technical methods and applications (like usage control mechanisms, data protection mechanisms in non-trusted outsourcing environments, electronic voting systems etc) as well as identity management and privacy protection issues will be presented. Furthermore, the impact of the aforementioned technologies on digital forensics and electronic crime investigation will be examines. Finally, the compliance of the legal and regulatory framework, as far as the personal data and privacy protection is concerned, with the existing security and privacy protection measures will be investigated.

Recommended Reading

1. Acquisti, A., Gritzalis, S., Lambrinoudakis, C., De Capitani di Vimercati S. (2008): Digital Privacy, Theory Technologies and Practices, Auerbach Publications.

3rd Semester

Course Code:	ΨΣ-ΑΦ-809
Course Title:	Secure Software for Advanced Services
Type of Course:	Optional
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	C. Lambrinoudakis, Assistant Professor C. Xenakis, Assistant Professor

Objective

The main objective of this course is to present the security issues, both in programming and application layers, towards the development of secure services. The students will acquire the required scientific background and also the specialized knowledge and expertise in order to develop and implement advanced services which achieve a high security level and are resilient to attacks.

Course Contents

Attacks at the service layer. Security in programming environments. Secure code development process. Web services security. Digital content security. Mobile agent security. Open source software security. Electronic services security (B2C, C2C, B2B, G2C, G2B).

Recommended Reading

1. Diomidis Spinellis and Georgios Gousios, editors. Beautiful Architecture: Leading Thinkers Reveal the Hidden Beauty in Software Design. O'Reilly, 2009. ISBN 9780596517984.

Course Code:	ΨΣ-ΑΦ-810
Course Title:	Socio-Economical Aspects of Security
Type of Course:	Optional
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	L. Mitrou

Objective

The objective of the course is to offer to the students an overview of the social, economical and institutional issues which pertain to the ICTs and especially to security. The knowledge of the regulatory context of ICTs and of the main legal rules and principles allows the students to integrate their technical knowledge in a wider social, economical and institutional context. Understanding the requirements of the socio-economic environment and the regulatory system is of major importance, since it enhances the inter-disciplinary knowledge and approach and also provides the students with a wider range of skills which prove to be useful for their professional carrier.

Course Contents

Specific issues of data security and data protection: conflict and harmonization of security and data protection requirements (especially in the case of employees' monitoring), privacy protection in the Web (search engines, social networking etc.), medical data in medical information systems and communications secrecy. Economic aspects of data security and data protection. Intellectual property in the Information Society: software and database protection, open source, licences, issues relating to peer to peer. Freedom of speech, rights and powers in the Information Society – Blogs –Forums, filtering and censorship. Cybercrime and Computer crime: ethical, social, legal and economical aspects. Penal law and ICTs. Computer/Internet Forensics.

Course Code:	ΨΣ-ΑΦ-811
Course Title:	Digital Services Security
Type of Course:	Optional
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	C. Lambrinoudakis, Assistant Professor
	C. Xenakis, Assistant Professor

Objective

The students will be trained on the ISO 27001:2005 – information security management system (isms) auditor/lead auditor certification procedures. This training will allow students to register as IRCA Quality Inspectors (ISO 27001:2005 IRCA certified A17242).

Course Contents

ISO 27001:2005 requirements. Design of an Information Security Management System (ISMS). Security inspection methodology and procedures. Lab exercises and case studies.

Recommended Reading

1. ISO 27001 series of standards.

Course Code:	ΨΣ-ΑΦ-812
Course Title:	Applied Security Services and Solutions
Type of Course:	Optional
Year of Study/ Semester:	2nd / 3rd
ECTS Credits:	7,5
Faculty:	C. Xenakis, Assistant Professor
	C. Ntantogian,, Adjunct Lecturer

Objective

The main objective of this course is the familiarization of the students with a series of practical security tools and specifically with their installation and utilization in the laboratory.

Course Contents

There will be a series of practical exercises that will simulate different types of attacks at different environments (for instance Wireless, VoIP etc). At the same time, various detection – prevention tools and mechanisms will be employed for handling the attacks.

Recommended Reading

1. User Guides of the various security tools that will be used.

2.6 Ph.D. Programme

This is a research programme leading to a Ph.D. degree in «Digital Systems» with research focusing mainly the following areas:

- Network Oriented Systems and Services
- Digital Health Services
- Telecommunication Networks and Integrated Services
- Security Systems
- Intelligent Systems and Multimedia Technologies
- Telecommunication Systems
- Technology – enhanced Learning

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