

HELLENIC MEDITERRANEAN UNIVERSITY

School of Engineering

Department of Electrical and Computer Engineering

COURSE OUTLINES

12 courses

ADVANCED TOPICS IN ARTIFICIAL INTELLIGENCE

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	8000.1.121.0	SEMESTER	2nd
COURSE TITLE	Advanced Topics in Artificial Intelligence		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS
	5	7.5
Total	5	7.5

COURSE TYPE general background, special background, specialised general knowledge, skills development	
PREREQUISITE COURSES	All students are expected to have background from the following undergraduate courses: Algorithms, Data Structures, Discrete maths, Logic and Introduction to AI.
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/TP281/

2. LEARNING OUTCOMES
Learning outcomes
The students are expected to get the required knowledge in order to be able to develop projects and to carry out research in selected, state of the art topics of AI. That is, in <i>Machine Learning</i> and in particular in Statistical relational learning.
General Competences
The primary aim of this course is to teach students advanced techniques of modern AI. In addition, it equips students with the appropriate programming tools for developing AI applications. Moreover, the course fosters an appreciation for the engineering issues underlying the design and development of AI systems.

3. SYLLABUS
Overview of Machine Learning. Statistical Relational Learning. Probability Theory & Bayes' Rule. Probability & Random Variables. Reasoning under Uncertainty I. Reasoning under Uncertainty II. Probabilistic Graphical Models - Bayesian Networks. Markov Networks. Probabilistic Inference. Probabilistic Logic Programming: ProLog, Cplint. Implementation of Markov Models & HMM.

4. TEACHING and LEARNING METHODS - EVALUATION	
DELIVERY Face-to-face, Distance learning, etc.	Lectures using power-point slides.

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Programming, Word and Power-point are used for developing assignments. Internet is used for assignments and lectures. For example, eClass is used for uploading lectures, assignments, bibliography etc.	
TEACHING METHODS The manner and methods of teaching are described in detail.	Activity	Semester workload
	Assignments and projects	7
	class attendance	5
	Course total	12
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	• 4 assignments 40% (each assignment is graded 10%). • 1 project 60%.	

5. ATTACHED BIBLIOGRAPHY

1. D. Poole, A. Mackworth, *Artificial Intelligence – Foundations of Computational Agents*, Cambridge University Press, Third Edition, 2023.
2. S. Russell, P. Norving, *Artificial Intelligence – A Modern Approach*, 4th edition, Pearson, 2022.
3. M. P. Deisenroth, A. A. Faisal, C. S. Ong, *Mathematics for Machine Learning*, Cambridge University Press, 2020.
4. G. Bontempi, *Handbook of Statistical Foundations for machine Learning*, Comp. Science Department, Universite Libre de Bruxelles, Belgique, 2017.
5. L. De Raedt, K. Kersting, S. Natarajan, D. Poole, *Statistical Relational Artificial Intelligence*, Morgan & Claypool Publ, 2016.
6. D. Koller, N. Friedman, *Probabilistic Graphical Models – Principles and Techniques*, The MIT Press, 2009.
7. L. De Raedt, *Logical and Relational Learning*, Springer, 2008.
8. D. Bertsekas, J. Tsitsiklis, *Introduction to Probability*, 2nd Edition, Athena Scientific, 2008.
9. L. Getoor, B. Taskar, *Introduction to statistical relational learning*, The MIT Press, 2007.

POWER ELECTRONICS

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.7.003.0	SEMESTER	1st
COURSE TITLE	Power Electronics		
INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS	
	4	4	
Total	4	4	
COURSE TYPE general background, special background, specialised general knowledge, skills development	Special background / Core		
PREREQUISITE COURSES	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English		
OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE141/		
2. LEARNING OUTCOMES			
Learning outcomes			
The course "Power Electronics I" aims to provide students with basic knowledge on the semiconductor power modules and power converters built based on them. More specifically, it refers to the structure, operation, special features and applications of different types of power converters. It also covers elements of Fourier analysis and electric power quality. Upon successful completion of the course, students will be able to: 1. describe and explain the structure, the characteristics, the capabilities and operation of basic power semiconductor elements 2. identify and describe the basic topologies of power converters (rectifiers, AC regulators, choppers, inverters) 3. identify and describe the basic control techniques of the above converters 4. examine and analyze the operation of converters and explain the characteristics of voltage-current waveforms at their input and output 5. explain the principles of Fourier analysis and apply it to the calculation of harmonic components, distortion, etc. of voltage-current waveforms 6. select the appropriate power converter for a given application.			
General Competences			

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Autonomous work
- Teamwork
- Work in an interdisciplinary environment
- Production of new research ideas

3. SYLLABUS

Theoretical Lecture Sections

- Introduction to power electronics - relation to other scientific fields. Classification of electronic power converters and their applications.
- Structure and functional characteristics of semiconductor power components (power diode, thyristor, BJT, MOSFET, GTO, IGBT, ...).
- Uncontrolled rectifier circuits (using power diodes): Single-phase and three-phase rectifier topologies. Effect of the network's internal inductance (transition).
- Controlled rectifiers (using thyristors): Topologies of single-phase and three-phase fully controlled inverters, voltage and current waveforms, calculation of active and reactive power.
- AC converters: AC regulators with anti-parallel thyristors, reference to cycloconverters.
- DC to DC converters: Basic topologies of DC to DC converters (step-down, step-up). Analysis of the Pulse Width Modulation (PWM) technique and its application to them.
- AC to DC converters: Topology of single-phase (half-full bridge) and three-phase switching inverter. Analysis of operation with PWM.
- Principles of Fourier analysis and calculation of harmonic components. Derivation of spectrum. Calculation of active / reactive power, RMS value, total harmonic distortion and application to AC converters.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Project-based, Individual study	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students		
TEACHING METHODS The manner and methods of teaching are described in detail.	Activity	Semester workload
	Lectures	0
	Laboratory Exercises	10
	Study and report writing	50
	Independent study	50
	Study and literature review	10
	Course total	120
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	Project evaluation (60%) Oral exam on given Power electronics syllabus (40%)	

5. ATTACHED BIBLIOGRAPHY

- *Suggested bibliography*

- Mohan N., Undeland T. M., Robbins W. P., "Introduction to Power Electronics", 3rd edition, Publisher: Tziola, Thessaloniki, 2010.
- Rashid M., "Power Electronics", 1st edition, Publisher: "ION" Publishing Group, Athens, 2010.
- Manias St. "Power Electronics", 2d edition, Publisher: Symeon, Athens, 2017.
- Kioskeridis I., "Power Electronics", 1st edition, Publisher: Tziola, Thessaloniki, 2008.

- *Relevant scientific journals:*

- IEEE Transactions on Power Electronics
- IEEE Transactions on Industrial Electronics
- IEEE Transactions on Industry Applications
- IEEE Journal of Emerging and Selected Topics in Power Electronics
- IET Power Electronics

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, HELLENIC MEDITERRANEAN UNIVERSITY

ADVANCED TECHNOLOGY ELECTRONIC DEVICES

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.7.016.0	SEMESTER	1st
COURSE TITLE	Advanced Technology Electronic Devices		
INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS	
	0	4	
Total	0	4	
COURSE TYPE general background, special background, specialised general knowledge, skills development			
PREREQUISITE COURSES	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English		
OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)			
2. LEARNING OUTCOMES			
Learning outcomes			
The aim of the course is to familiarize students with the physical and electrical properties of organic semiconductors and the corresponding devices. Upon successful completion of the course, the student will be able to: • Assess the physical and electrical properties of organic semiconductors. • Understand the mechanisms of current conduction through these materials. • Understand the procedures and methodology for studying the structure and properties of organic materials, and be acquainted with the modern fabrication methods currently used in the design of flexible materials and devices. • Describe and analyze the operating principles of the basic organic electronic devices: from transistors to photovoltaic cells & systems, organic light-emitting diodes (OLEDs) and lasers. • Know and apply the appropriate characterization protocols for the electrical and optical characterization of the various electronic devices for the reliable evaluation of their performance. • Be able to use bibliographic databases to find and evaluate the most relevant articles in the field of their work.			
General Competences			

The course aims at the acquisition, by the graduate, of the following general competences:

- Understand the procedures and methodology for studying the structure and properties of organic materials, and be familiar with the modern fabrication methods currently used in the design of flexible materials and devices.
- Describe and analyze the operating principles of the basic organic electronic devices.
- Know and apply the appropriate protocols for electrical characterization in order to evaluate the performance of the various electronic devices.
- In the context of the literature searches they will be asked to carry out, be able to independently evaluate and extract the most useful information, thereby developing critical thinking both as a reader and as a writer.
- In the context of presenting their results, be able to function as a member of a research team and within an interdisciplinary environment.

3. SYLLABUS

Here's the English translation:

The aim of the course is familiarization with "printable" electronic devices that are not based on inorganic semiconductors, such as silicon, but on organic semiconductors fabricated using printing technologies, which constitute a pioneering category of electronics with enormous market potential in four key application areas: displays, photovoltaics, lighting and bio-electronic systems. To achieve this goal, the course is structured as follows:

Theory

A. Organic Semiconductors

- Conductive Conjugated Polymers and Small Organic Molecules.
- Electronic Structure and Electronic Properties.
- Correlation between chemical structure and optoelectronic properties.
- Synthesis and Characterization Techniques for Organic Semiconductors

B. Organic optoelectronic devices

- Photovoltaic Cells (OPVs)
- Light-Emitting Diodes (OLEDs)
- Organic Semiconductor Lasers
- Optical displays
- Colorimetry and cathode ray tube displays
- Field-Effect Transistors (OFETs)

C. Flexible electronic devices

- Printing techniques for electronic devices
- Flexible sensors
- Printed organic thin-film transistors
- Flexible bio-electronic devices

D. Characterization Techniques for Semiconductor Devices

- Morphological Characterization (AFM)
- Structural Characterization (X-ray spectroscopy)
- Elemental Characterization (Absorption, Raman and FTIR)
- Electrical Characterization (Hall characterization)

Laboratory: Fabrication and characterization of OPVs

- Processing of organic electronic thin-film layers by spin coating
- Thermal deposition of metals
- Optical characterization of organic electronic thin films
- Fabrication of PVs (perovskite)
- PV performance analysis (J/V, EQE, IQE)
- PV stability analysis

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY

Face-to-face, Distance learning, etc.

Πρόσωπο με πρόσωπο στην τάξη

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	• Use of ICT in laboratory education • Use of ICT in communication with students via the e-class electronic platform • Specialized software in laboratory exercises • Support of the learning process via the e-class electronic platform	
TEACHING METHODS The manner and methods of teaching are described in detail.	Activity	Semester workload
	Course total	
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	Students are assessed through: • Laboratory work: performance and participation in the laboratory exercises • Written laboratory report on the fabrication and characterization of PV devices • Oral presentation of the results	

5. ATTACHED BIBLIOGRAPHY
1. E. Cantatore (ed.), <i>Applications of Organic and Printed Electronics: A Technology-Enabled Revolution</i>, Springer, 2013, ISBN 978-1-4614-3160-2 2. H. Klauk (ed.), <i>Organic Electronics II: More Materials and Applications</i>, Wiley-VCH, 2012, ISBN 978-3-527-32647-1 3. C. Brabec, U. Scherf, V. Dyakonov (eds.), <i>Organic Photovoltaics: Materials, Device Physics, and Manufacturing Technologies</i>, 2nd Edition, Wiley-VCH, 2014, ISBN 978-3-527-65693-6 4. S. R. Forrest, <i>Organic Electronics: Foundations to Applications</i>, Oxford University Press, 2020, ISBN 978-0-19-852953-3 5. P. Cosseddu, M. Caironi (eds.), <i>Organic Flexible Electronics: Fundamentals, Devices, and Applications</i>, Woodhead Publishing (Elsevier), 2021, ISBN 978-0-12-818890-3 6. G. Nisato, D. Lupo, S. Ganz (eds.), <i>Organic and Printed Electronics: Fundamentals and Applications</i>, Jenny Stanford Publishing, 2016, ISBN 978-981-4669-74-0

HUMAN COMPUTER INTERACTION

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.7.029.0	SEMESTER	1st
COURSE TITLE	Human Computer Interaction		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS
	0	4
Total	0	4

COURSE TYPE general background, special background, specialised general knowledge, skills development	Special background / Core
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek / English
OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE157/

2. LEARNING OUTCOMES
Learning outcomes
The course aims to introduce students to the theory of Human Computer Interaction and the engineering practices of interactive systems and user interfaces. This is attempted by blending concepts from design theories and practice, engineering methods and techniques and evaluation of interactive software. Specific modules are further exposed in laboratory settings where students become acquainted with a) interactive technologies and their physical, syntactic and semantic analysis b) the user-centred approach to designing interactive systems and c) the architectural models, programming techniques and methodology for developing user interfaces.
General Competences
Successful completion of the course will promote general skills including • Teamwork in framing, understanding and tackling HCI design challenges • Searching, analysing and conceptualizing solutions • Decision making given options in a design space • Development of presentation skills and argumentative discourse

3. SYLLABUS

Topics include the following:

- Introduction to the principles of interaction and the multi-disciplinary nature of the underlying domain of discourse
- Review of interactive technologies and their physical, syntactic and semantic layers of analysis
- Detailed treatment of physical – lexical level analysis of user interfaces covering input / output devices and models, morphological analysis of input devices and interaction objects
- Dialogue models covering early efforts such as BNF Grammars, Task Action Grammar, UAN, as well as more recent approaches such as event-models
- Semantic analysis of user interfaces and interaction metaphors
- Theory-based HCI and models (including Ergonomic analysis, Fitts law, cognitive models (KLM, GOMS, NL-GOMS) and architectures
- User centered design and methods (premises and concepts)
- Scenario-based design and techniques
- Design space analysis
- Prototyping methods and tools
- User interface software and technologies (toolkits, IDEs, scripting)
- Implementation methods and tools

In the laboratory students engage in individual exercises and a case study which addresses most of the issues raised in the theory part.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face to face / distance learning	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	e-class	
TEACHING METHODS The manner and methods of teaching are described in detail.	Activity	Semester workload
	Lecturing	40
	Mini-projects / case study	80
	Course total	120
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	The course grade is based on project-based assessments of written (30 %), presentation (30 %) and practical work (40 %).	

5. ATTACHED BIBLIOGRAPHY

D. Akoumianakis (2006): *Designing the user Interface, A modern approach*, Athens: Kleidarithmos
 J. Jacko & A. Sears Eds., (2003): *The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications*, Routledge.
 N. Avouris (2000): *Human Computer Interaction*, Diavlos Publishing.
 Instructors' notes
Selected papers from ACM Transactions on Computer Human Interaction, Human Computer Interaction and International Journal of Human Computer Interaction

ELECTRICAL MACHINES II

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.8.002.0	SEMESTER	2nd
COURSE TITLE	Electrical Machines II		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS
	0	6
Total	0	6

COURSE TYPE general background, special background, specialised general knowledge, skills development	Special background / Core
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE143/

2. LEARNING OUTCOMES
Learning outcomes
The course "Electric Machines II" aims to give students the necessary knowledge on AC electric motors. More specifically, it refers to the structure, operation, special features and applications of different types of AC motors. Upon successful conclusion of this course, the students will be able to: 1. describe and explain the structure, structural characteristics and basic design principles of AC machines, 2. to experimentally determine and numerically calculate the parameters of the equivalent circuit of each machine, 3. examine and analyze the operation of AC motors through the corresponding equivalent circuits, 4. identify and distinguish the different types and variants of AC motors, 5. to create and reconstruct corresponding wiring connections of AC motors in the laboratory, 6. compare the alternatives and suggest the appropriate AC motor for a given application.
General Competences
• Search, analysis and synthesis of data and information, using the necessary technologies • Adaptation to new situations • Autonomous work • Teamwork • Work in an interdisciplinary environment • Production of new research ideas

3. SYLLABUS

Theoretical Lecture Units

- General: Creation of a rotating magnetic field.
- Synchronous machines: Structure, principle of operation, characteristics, types, excitation, equivalent circuits, vector equation - vector diagram, power flow diagram, losses and efficiency. Experimental determination of equivalent circuit parameters. Study of a synchronous machine for motor/generator operation. For generator operation: Autonomous operation - synchronization, behavior in changes of load and excitation current, specifications. For motor operation: Starting, behavior in changes of load and excitation current.
- Three phase asynchronous motors: Structure, structural characteristics, types (squirrel cage, wound rotor), principle of operation, concept of slip, equivalent circuit, vector equation - vector diagram, power flow diagram, losses and efficiency, torque-speed characteristic, changes on the characteristic.
- Single phase asynchronous motor: Structure and principle of operation, equivalent circuit, starting.
- Reference to special types of motors (Universal, Synchronous reluctance, Switched reluctance).

Laboratory Exercises

1. Study of synchronous AC machines.
2. Study of parallel operation of alternators and synchronous motor loading.
3. Starting of three-phase asynchronous motors, of squirrel cage and slip-ring type.
4. Study of power balance and loading of an asynchronous squirrel cage motor.
5. Study of single-phase asynchronous motor.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Project-based, Individual study	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students		
TEACHING METHODS The manner and methods of teaching are described in detail.	Activity	Semester workload
	Lectures	0
	Laboratory Exercises	20
	Συγγραφή εργ. αναφορών	20
	Independent study	80
	Study and literature review	60
	Course total	180
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	a) Project evaluation, b) Oral exam on given syllabus	

5. ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*
 - Stephen Chapman, 'AC-DC Electric Machines'
 - Hubert I. Charles, 'Electric Machines': Theory, Operation, Applications, Adjustment, and Control
- *Relevant scientific journals:*
 - IEEE Transactions on Energy Conversion
 - IEEE Transactions on Industry applications
 - IET Electric Power Applications

OPERATING SYSTEMS

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.8.009.0	SEMESTER	2nd
COURSE TITLE	Operating Systems		
INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS	
	0	4	
Total	0	4	
COURSE TYPE general background, special background, specialised general knowledge, skills development	Compulsory Elective		
PREREQUISITE COURSES	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English		
OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE147		
2. LEARNING OUTCOMES			
Learning outcomes			
The knowledge which students acquire upon successful completion of the course relates to design and implementation of modern operating systems (OSes). More specifically, the students are taught concepts related to the lifecycle of processes and threads, SystemV/POSIX shared memory, and resource sharing, focusing on inter-process communication and synchronization primitives (IPC message queues, pipes, UNIX signals, and POSIX locks, semaphores, barriers, and condition variables). They are also exposed to techniques that can detect or avoid hazards, such as data race and protocol deadlock, and guided to examine cost-efficient solutions of classical OS problems, such as producer-consumer, readers-writers, dining philosophers, and sleeping barber. Students are finally introduced to complex OS kernel functions and high-level services, related to job scheduling, virtual-to-physical address translation, memory management, file system operations, and I/O device management. The skills, which students develop upon successful course completion, relate to: • Understanding the design, implementation, operation, and high-level services of modern OSes • Understanding fundamental issues related to resource management in Linux and real-time OSes • Programming in consistent and efficient manner concurrent systems utilizing IPC • Embedding OS API functions (IPC, POSIX, SystemV) The abilities, which students develop upon successful course completion, relate to: • Enabling new problem-solving abilities, e.g. for avoiding hazards in concurrent systems • Learning shell & systems programming (C/C++ & GNU/Linux) and GNU software development			
General Competences			

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adapt solutions to new situations (resource sharing, congestion, contention etc)
- Autonomous work
- Teamwork
- Decision making
- Promoting liberal, creative and inductive/deductive thinking\
- Work in an interdisciplinary environment

3. SYLLABUS

Theoretical Lectures

The theoretical part concentrates on the following topics:

- Introduction to OS Design, Architecture and Services, Examples, Open vs Free Software
- Processes & Threads, IPC, Shared Memory, Hazards (Data Races, Deadlocks), IPC functions
- Classical OS Problems and Solutions
- Job Scheduling Algorithms, Implementations
- Virtual-to-Physical Address Translation
- Memory Management, Paging Systems, Replacement Algorithms, Implementations
- File Systems, Kernel support, Examples
- I/O Device Management, Device Drivers Types
- Special OS Topics

Lab

Students are introduced to Linux OS implementation. Hands-on activities relate to shell programming and systems programming, focusing on task management and efficient use of different IPC functions. In addition through simple demos, students are exposed to sophisticated OS topics, such as kernel scheduling policies, paging and address translation (GNU/Linux page maps, analysis), file systems (simpleFS), and I/O device management (UART-to-SPI TTY driver of an LCD).

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Eclass for Optional Exercises. Project Presentations/Demonstration in the Lab	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Using Eclass	
TEACHING METHODS The manner and methods of teaching are described in detail.	Activity	Semester workload
	Course total	
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	All announcements related to the syllabus, including complementary reading material, solved exercises, and optional homework problems, are permanently posted in the course web page (ECLASS). The course grade incorporates the following evaluation procedures: 1. Final Oral Exam on theoretical/practical problems (50%) 2. Project (50%) or Project	

5. ATTACHED BIBLIOGRAPHY

Bibliography:

- Andrew S. Tanenbaum, and H. Bos, "Modern Operating Systems", 3rd Edition, Prentice Hall, 2018.
- W.R. Stevens and S.A. Rago, "Advanced Programming in the UNIX Environment", 3rd edition, Addison-Wesley (2013), ISBN 978-0321637734.
- A. Silberschatz, P. B. Galvin, and G. Gagne, "Operating System Concepts", 9th Edition, Wiley (2013), ISBN 978-1118093757, <http://os-book.com>

Other Important Sources

- Eclass - <http://eclass.hmu.gr> (notes, examples, open source code)

Relevant Scientific Journals:

- ACM Symposium on Operating Systems Principles (SOSP)
- Operating Systems Design and Implementation (OSDI)
- Workshop on Hot Topics in Operating Systems (HotOS)
- Architectural Support for Programming Languages and Operating Systems (ASPLOS)
- Linux Foundation conferences, e.g., Open Source Forum
- Linux Plumbers Conference

ADVANCED TOPICS IN DATABASES

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.8.023.0	SEMESTER	2nd
COURSE TITLE	Advanced Topics in DataBases		
INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS	
	0	4	
Total	0	4	
COURSE TYPE general background, special background, specialised general knowledge, skills development	Special background / Core		
PREREQUISITE COURSES	Sucessful completeion of an Introductory course on Databases		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek and English		
OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE158/		
2. LEARNING OUTCOMES			
Learning outcomes			
The course aims to present current and emerging approaches to the modeling, design and development of database applications. The course builds on the foundations of the introductory third-semester course “Introduction to databases” which is considered a prerequisite. The specific targets of the course cover four thematic areas, namely (a) review of classical data models and database management systems (b) theory of database design (c) advanced data models and (d) databases and the internet. Accordingly, the course outline is formed around these four thematic areas.			
General Competences			
Successful completion of the course will promote general skills including • Analysing an information system and record the logical structure of the data used in alternative forms and using alternative tools • Designing relational schemata to obey to advanced normal forms • Transforming data across data modeling frameworks • Understand the basics of alternative approaches to database development with emphasis on object-orientation, graph databases and deductive systems			
3. SYLLABUS			

The theoretical part will cover:

- Introduction to data modeling and relational database management systems: Overview of classical data models, The relational approach to database development, Overview of SQL and Relational Algebra, Extensions to the basic relational data model, summary of advanced data modeling approaches.
- Relational design theory: Functional dependency theory, Schema decomposition, Desirable properties of well-formed schema, Assessment of decomposition, closure of a set of attributes, Applications of functional dependency theory, Normal forms
- Alternative data models and approaches to database development: Database modelling and the Unified Modelling Language (UML), Transformation of UML models to relational schema and vice versa, Object-oriented concepts and object orientation to databases, (e.g., abstract data types, inheritance, isa- and part-of hierarchies), object-relational databases (SQL3), Graph databases, Deductive databases.
- NoSQL systems and data model mappings (e.g., relations to property graph and vice versa)

In the laboratory students engage in individual exercises and a case study which addresses most of the issues raised in the theory part.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face to face / distance learning								
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	e-class and PostgreSQL								
TEACHING METHODS The manner and methods of teaching are described in detail.	<table> <tr> <th>Activity</th><th>Semester workload</th></tr> <tr> <td>Lecturing</td><td>40</td></tr> <tr> <td>Project-based work / case study</td><td>80</td></tr> <tr> <td>Course total</td><td>120</td></tr> </table>	Activity	Semester workload	Lecturing	40	Project-based work / case study	80	Course total	120
Activity	Semester workload								
Lecturing	40								
Project-based work / case study	80								
Course total	120								
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	The course grade is based on project-based assessments of written (30 %), presentation (30 %) and practical work (40 %).								

5. ATTACHED BIBLIOGRAPHY

H. [Garcia-Molina](#), J. [Ullman](#), J. [Widom](#) (2020): *Database Systems (single volume)*, Crete University Publishing.

A. Silberschatz, H. F. Korth & S. Sudarshan (2001): *Database System Concepts (4th Edition)*, McGraw-Hill ISBN 0-07-255481-9.

R. Elmasri & S. Navathe (1996): *Fundamentals of Database Systems*, Μετάφραση στα Ελληνικά από τις εκδόσεις "ΔΙΑΥΛΟΣ".

Instructor's notes and papers

ELECTRICAL DRIVE SYSTEMS

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.9.005.0	SEMESTER	1st
COURSE TITLE	Electrical Drive Systems		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS
	0	4
Total	0	4

COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialised general knowledge
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE144/

2. LEARNING OUTCOMES
Learning outcomes
The course aims to give students basic knowledge on the structure and operation of Electric Motor Drive Systems, i.e. the control and power devices used to drive electric motors. The course presents the general principles of Electric Drive Systems and analyzes the specific characteristics of systems for driving DC and AC motors. Upon successful conclusion of this course, the students should be able to: 1. identify and explain which electrical quantities and in what way they should be adjusted in order to apply the desired control on the driven motor - load, 2. describe and explain the structure, characteristics, capabilities and operation of the basic devices currently used to control DC and AC electric motors, 3. distinguish the differences and possibilities of the different control devices, as well as the requirements of the different types of mechanical load, 4. compose or propose the appropriate system for driving a given type of motor or load.
General Competences
• Search, analysis and synthesis of data and information, using the necessary technologies • Adaptation to new situations • Autonomous work • Teamwork • Work in an interdisciplinary environment • Production of new research ideas

3. SYLLABUS

Theoretical Lecture Units

1. Structural elements and basic characteristics of electric motor drive systems. System structure, understanding of the effect of the load's torque-speed characteristic on the selection and stability of the system. Drive system selection criteria. Analysis of operation in the four quadrants.
2. Systems with DC motors: Methods of controlling the speed-torque of direct current motors. Starting, braking, speed control with field weakening. Analysis of the operation of power converters (semi / fully controlled rectifiers and choppers) for the control of DC motors.
3. Systems with AC motors (asynchronous): Speed-torque control methods for three-phase asynchronous squirrel cage and wound rotor motors. Effect of supply voltage and frequency, and rotor resistance. Starting, braking, speed control with constant V/f ratio. Speed control of slip ring motors with slip power recovery. Analysis of the operation of power converters for soft start (soft starters) and speed regulation (inverters) of three-phase asynchronous motors.

Laboratory Exercises

They include laboratory exercises and simulations using MATLAB-Simulink.

1. DC motor starting.
2. DC motor speed control.
3. Start and adjustment of speed and torque of separately excited DC motor.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Project-based, Individual study	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students		
TEACHING METHODS The manner and methods of teaching are described in detail.	Activity	Semester workload
	Lectures	0
	Laboratory Exercises	20
	Study and report writing	20
	Independent study	30
	Study and literature review	50
	Course total	120
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	a) Project evaluation, b) Oral exam on given syllabus	

5. ATTACHED BIBLIOGRAPHY

- Recommended bibliography:
 - Krishnan R., "Electric Motor Systems: Modeling, Analysis and Control", 1st edition, Klidarithmos Publications, Athens, 2009.
 - Mohan N., Undeland TM, Robbins W. P., "Introduction to Power Electronics", 3rd edition, Tziola Publications, Thessaloniki, 2010.
 - Rashid M., "Power Electronics", 1st edition, Ion Publications, Athens, 2010.
- Relevant scientific journals:
 - IEEE Transactions on Power Electronics
 - IEEE Transactions on Industrial Electronics
 - IEEE Transactions on Industry Applications

ADVANCED PHOTOVOLTAIC DEVICES

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.9.008.0	SEMESTER	1st
COURSE TITLE	Advanced Photovoltaic Devices		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS
	0	4
Total	0	4

COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialised general knowledge
PREREQUISITE COURSES	Ηλεκτροτεχνικά Υλικά Ι
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE116

2. LEARNING OUTCOMES
Learning outcomes
The purpose of the course is to familiarize students with the operating principles and development of new technologies in modern photovoltaic systems, as well as their design and evaluation. Upon successful completion of the course, the student will be able to: • Understand the operating principle of new-technology PV devices based on classical semiconductor theory. • Explore the growth techniques of organic/hybrid materials and the fabrication stages of the corresponding PV devices at both small and large scale. • Design electrical characterization techniques for the calculation of the PV parameters of the devices, along with the corresponding protocols for measuring PV lifetime. • Use bibliographic databases to find and evaluate the most relevant articles in the field of their work. • Orally present and explain in detail their research/literature project.
General Competences
The course aims at the acquisition, by the graduate, of the following general competences: • Search for, analysis and synthesis of data and information, with the use of the necessary technologies. • Adapting to new situations. • Working in an interdisciplinary environment. • Team work. • Promotion of free, creative and inductive thinking. • Production of new research ideas. • Search for, analysis and synthesis of data and information, with the use of the necessary technologies.

3. SYLLABUS

Here's the English translation:

The aim of the course is familiarization with the operating principles, fabrication methods and electrical characterization of third-generation photovoltaic devices, which are not based on silicon, but on organic and hybrid semiconductors that can be fabricated using printing technologies. To achieve this goal, the course is structured as follows:

- Introduction and Historical Review of third-generation PVs
- Operating Principles of organic photovoltaics (OPVs)
- Methods for OPV performance characterization
- Characterization methods and stability protocols for OPVs
- Introduction to hybrid perovskite photovoltaics (HPVs)
- Operating principles of HPVs
- The role of two-dimensional materials in HPVs
- Tandem devices
- Printing-based production technology for OPVs & HPVs
- Laboratory: Fabrication and electrical characterization of PV devices.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Πρόσωπο με πρόσωπο στην τάξη	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	• Use of ICT in laboratory education • Use of ICT in communication with students via the e-class electronic platform • Specialized software in laboratory exercises • Support of the learning process via the e-class electronic platform	
TEACHING METHODS The manner and methods of teaching are described in detail.	Activity	Semester workload
	Course total	
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	Students are assessed through: • Laboratory work: performance and participation in the laboratory exercises • Written laboratory report on the fabrication and characterization of PV devices • Oral presentation of the results	

5. ATTACHED BIBLIOGRAPHY

1. J. Bisquert, *The Physics of Solar Cells: Perovskites, Organics, and Photovoltaic Fundamentals*, CRC Press, 2017, ISBN 9781138099968
2. M. A. Green, *Third Generation Photovoltaics: Advanced Solar Energy Conversion*, Springer, 2003, ISBN 978-3-540-26562-7
3. C. Brabec, U. Scherf, V. Dyakonov (eds.), *Organic Photovoltaics: Materials, Device Physics, and Manufacturing Technologies*, 2nd Edition, Wiley-VCH, 2014, ISBN 978-3-527-65693-6
4. N.-G. Park, M. Gratzel, T. Miyasaka (eds.), *Organic-Inorganic Halide Perovskite Photovoltaics: From Fundamentals to Device Architectures*, Springer, 2016, ISBN 978-3-319-35112-4
5. T. Miyasaka (ed.), *Perovskite Photovoltaics and Optoelectronics: From Fundamentals to Advanced Applications*, Wiley-VCH, 2021, ISBN 978-3-527-34748-3
6. M. Pazoki, A. Hagfeldt, T. Edvinsson (eds.), *Characterization Techniques for Perovskite Solar Cell Materials*, Elsevier, 2020, ISBN 978-0-12-814727-6
7. F. C. Krebs (ed.), *Stability and Degradation of Organic and Polymer Solar Cells*, Wiley, 2012, ISBN 978-1-119-95251-
8. M. V. Khenkin et al., "Consensus statement for stability assessment and reporting for perovskite photovoltaics based on ISOS procedures," *Nature Energy* 5, 35–49 (2020) — directly supports the stability protocols unit

COMPUTER SYSTEMS SECURITY

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.9.015.0	SEMESTER	1st
COURSE TITLE	Computer Systems Security		
INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS	
	0	4	
Total	0	4	
COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialization		
PREREQUISITE COURSES	Operating Systems		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English		
OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE150		
2. LEARNING OUTCOMES			
Learning outcomes			
The knowledge which students acquire upon successful completion of the course relates to understanding the design of multilayer protection mechanisms for computing systems, with an emphasis on embedded systems security. Security primitives are examined in detail, including lightweight cryptographic software libraries and hardware security devices (programmable crypto engines, crypto ICs). In addition, security patterns/protocols for efficient access control, data privacy, anonymity, confidentiality, integrity, and availability are examined. Case studies range from device security (cryptos), to memory protection/isolation (ARM Trustzone), to operating system kernel and file system support, to application and system/network security, including high-level security event tracing, correlation, and visualization. The skills, which students develop upon successful course completion, relate to: • Understanding the design and use of public key and symmetric cryptography (lightweight) • Understanding the design and use of digital certificates and signatures • Designing and implementing protocols and techniques for security and data privacy at device, system/network, and application level The abilities, which students develop upon successful course completion, enable problem-solving abilities that relate to • Integrating security/trust in system/platform design and implementation • Implementing secure embedded systems using lightweight security primitives/protocols • Validating security functions and evaluating overheads of at device-, system-, and network-level			
General Competences			

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adapt solutions to new situations (resource sharing, congestion, contention etc)
- Autonomous work
- Teamwork
- Decision making
- Work in an interdisciplinary environment
- Promoting liberal, creative and inductive/deductive thinking

3. SYLLABUS

Theoretical Lectures

- History – Classical Cryptography- Mathematical Preliminaries
- Authentication, Authorization
- SW Vulnerabilities - Memory Errors/Buffer Overflows, Viruses, Worms
- Side Channel, Energy Profiling, Covert Channel
- Buffer Overflows
- Operating System and Network Security (DDoS, Firewall, IPSec, OpenSSL/TLS, OpenVPN, syslog/IDPS)
- Symmetric Cryptography, NIST-approved Operating Modes
- Public Key Cryptography (RSA, Diffie Hellmann) & Elliptic Cryptography
- Security Primitives, Protocols, and Services
- Digital Certificates & Signatures
- Message Authenticity - Merkle Trees
- Application Security – Web/Ηλεκτρονικό Ταχυδρομείο (HTTPS, SMTP)
- Embedded Security, Cybersecurity & Safety, e.g. Smart Vehicles, e-Health platforms
- Special Topics (e.g. Blockchains, Steganography, Kerberos, Secret Sharing, Zero-Knowledge Proofs, Oblivious Transfers, Commit Protocols, HW Security (Crypto ICs, ARM Trustzone, Secure Boot/File Systems), Homomorphic Security, Quantum Cryptography, Data Privacy, Anonymity, Onion Routing/Tor, Legal Framework, GDPR, HIPAA etc)

Lab

The student lab focuses on open source hardware/software and Linux system security. Students gain experience in cryptographic mechanisms (AES encryption/decryption, integrity), authentication (SHA3, one-way hash functions), domain isolation, data privacy and anonymity by applying well-established security patterns for device, system/network, and application security. The lab also examines practical use of software tools, cryptographic security libraries, programmable crypto engines, and crypto ICs in experimental platforms and real embedded systems, such as healthcare and automotive.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Eclass for optional exercises. Project presentations and demonstrations in the Lab.	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Eclass	
TEACHING METHODS The manner and methods of teaching are described in detail.	Activity	Semester workload
	Course total	

STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

All announcements related to the syllabus, including grading, and complementary reading material, solved exercises, and optional homeworks, are permanently posted in the course web page (ECLASS). The course grade incorporates the following evaluation procedures:

1. Final Oral Exam on theoretical/practical problems (50%)
2. Term Project Presentation and Demonstration (50%)

The project usually relates to systems/network programming, Linux drivers & kernel modules, RTOS, real-time systems or small software stacks. Students provide weekly reports on their progress, and a final presentation and demonstration at the end of their project.

5. ATTACHED BIBLIOGRAPHY

Recommended Bibliography:

- P. C. Pfleeger, S. L. Pfleeger, J. Margulies, "Security in Computing", 5th edition, 2018. Prentice Hall, 2018.
- D. Basin, P. Schaller, M. Schlaepfer, "A Hands-on Approach", Springer, 2011.

Other Important Sources

- Eclass - <http://eclass.hmu.gr> (notes, examples, open source code)
- Development boards, pirate devices, virtual machines accompanied with open source software and manuals for examining attack and devising protection mechanisms

Relevant Scientific Journals & Conferences

- ACM Transactions on Privacy and Security
- IEEE Transactions on Dependable and Secure Computing
- IEEE Security & Privacy
- IEEE Transactions on Information Forensics & Security
- IEEE Transactions on Intelligent Transportation Systems
- IEEE Transactions on Vehicular Technology
- USENIX Security Symposium
- IEEE Symposium on Security and Privacy
- DEFCON and BLACKHAT conferences
- Embedded Security-related conferences, e.g. Embedded Security in Cars (ESCAR), Linux Security Summit, Automotive Linux Summit, Automotive Manufacturing Summit, Automotive World

REALISTIC MULTIMEDIA AND ANIMATION

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.9.022.0	SEMESTER	2nd
COURSE TITLE	Realistic Multimedia and Animation		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS
Lectures & Practice Exercises	5	7.5
Total	5	7.5

COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialised general knowledge
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek / English
OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/TP274/

2. LEARNING OUTCOMES
Learning outcomes
The course combines three fundamental ingredients in game programming: (a) physics, basically mechanics – kinematics and dynamics, (b) related mathematics and (c) numerical methods to describe and follow up the evolution of a specific problem. Additional game elements such as user interaction, guidance and control, will be implemented for a user-centered experience. Finally, students will have the opportunity to develop games of increasing complexity using popular/free game engines. Due to the material mix and focus, attending the course requires an avid interest in game development. Ideal candidates are: • Natural Sciences graduates (they have a good understanding of physics/math, but may need work on programming and SW engineering). • Informatics graduates (they have a solid background in programming/SW engineering, but may need to build physics/math knowledge).
General Competences
• Describe and follow up the evolution of a specific problem • User interaction and guidance and control • Support a user-centered experience. • Development of games of increasing complexity using popular/free game engines

3. SYLLABUS

- Recap: Basic Game Ingredients: Physics, Math, Numerical Methods, Design and Implementation. Points and Lines, Coordinate Systems, Distances between points and shapes, Applications to Collision Detection, Trigonometry.
- Vector and Matrix Operations: Scalar and Vector physical quantities; Common Geometrical Transformations (Translation, Scaling, Rotation) and their combinations.
- Rigid Body Motion: Speed, Velocity, Acceleration, Newton's Laws, Forces (gravitation, spring, friction, torque, Momenta (Linear & Angular), Center of Mass, Inertia Tensor, Work, Kinetic & Potential Energies, Conservation Laws.
- Rotational Motion and Rotational Dynamics.
- Rigid Body Motion: Newtonian & Lagrangian Dynamics – Equations of Motion for a Particle and for Particle Systems, the effect of Conservative and Dissipative Forces.
- Detecting and Handling Collisions.
- Relevant topics in Linear Algebra and Calculus.
- Selected Numerical Methods: Euler & Taylor methods, Runge-Kutta Methods, Extrapolation Methods, Numerical Stability.
- Topics in Game Engines: Workflow, Models, Environment, Shaders, Textures, Effects, Lighting Models, Transparency, Scripting, etc.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face										
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	• Powerpoint, Simulation Packages • e-class										
TEACHING METHODS The manner and methods of teaching are described in detail.	<table border="1"> <thead> <tr> <th>Activity</th><th>Semester workload</th></tr> </thead> <tbody> <tr> <td>Lectures</td><td>60</td></tr> <tr> <td>Homework</td><td>65</td></tr> <tr> <td>Self-study</td><td>100</td></tr> <tr> <td>Course total</td><td>225</td></tr> </tbody> </table>	Activity	Semester workload	Lectures	60	Homework	65	Self-study	100	Course total	225
Activity	Semester workload										
Lectures	60										
Homework	65										
Self-study	100										
Course total	225										
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	[30%] Weekly HWK assignments (theory or lab problems): These are individual - not group - assignments, intended for you to practice new material and hone your skills. Unless otherwise stated in the assignment itself, hwks will be due the following Tuesday @ 13:00 after they are announced in class (late HWK penalty 20%/day). [30%] Final Written Exam: Two weeks before the end of classes [40%] Term Project: Develop your own game using a game engine of your choice – kicks off around week #5. Term projects will be presented in class in the last 2 weeks of the semester. Project-level credit break up is as follows: • 10% : Project planning and execution: (make a plan, discuss it in class and follow up diligently) • 20% : Live Demo (quality of work, professionalism, oral presentation) • 10% : Packaging-Documentation: you will hand in a software package with source code, executables and detailed report detailing representative test run cases - also your code must be appropriately commented.										

5. ATTACHED BIBLIOGRAPHY

Bibliography:

- “Beginning Math and Physics for Game Programmers – 3rd ed”, W. Stahler, New Riders, 2004, ISBN 978-0735713901
- “Physics for Game Developers – 2nd ed”, D. M. Bourg, O’Reilly, 2013, ISBN 978-1-449-39251-2
- “Physics for Game Programmers”, G. Palmer, A.Press, 2005, ISBN 1-59059-472-X
- “Mathematics for Game Developers”, C. Tremblay, Thomson, 2004, ISBN 1-59200-038-X
- “Game Physics, Second Edition”, D. H. Eberly, Morgan Kaufmann, 2010, ISBN 978-0123749031
- Selected Articles & other readings from the current bibliography

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, HELLENIC MEDITERRANEAN UNIVERSITY

APPLIED MATHEMATICS

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	ΜΠ100Α	SEMESTER	1st
COURSE TITLE	Applied Mathematics		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	WEEKLY TEACHING HOURS	CREDITS
	5	
Total	5	7.5

COURSE TYPE general background, special background, specialised general knowledge, skills development	
PREREQUISITE COURSES	Basic Calculus and Basic Linear Algebra
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/TP370/

2. LEARNING OUTCOMES
Learning outcomes
Ability to use mathematical tools that are necessary for signal analysis and for the study of the electrical circuit
General Competences
Abstract thinking

3. SYLLABUS
Elements of Linear Algebra: Vector Spaces and Linear Maps, Matrices over Real and Complex Numbers (Operations, Determinants, Eigenvalues and Eigenstates, Little Spectral Theorem, Gauss-Jordan Elimination Process. The Discrete Fourier Transform. Laplace and Fourier Transforms: The L1 and L2 Spaces. Definitions of the Laplace and Fourier Transforms as particular cases of Integral Transforms, and properties of them. Probability Theory: Basic Definitions. The concept of a Continuous Distribution. Some typical examples. •

4. TEACHING and LEARNING METHODS - EVALUATION	
DELIVERY Face-to-face, Distance learning, etc.	On board
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Yes

TEACHING METHODS The manner and methods of teaching are described in detail.	Activity	Semester workload
	Four (4) hours per week (3 hours theory and 1 hour Exercises)	
	Course total	
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	•A midterm project (on Linear Algebra and Laplace Transform) measuring 30% of the final grade and a final exam measuring 70% of the final grade	

5. ATTACHED BIBLIOGRAPHY

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, HELLENIC MEDITERRANEAN UNIVERSITY

