COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	INFORMATICS AND COMPUTER ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE		**SEMESTER**	7th/9th
COURSE TITLE	EMBEDDED SYSTEMS		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	
Labs	1	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).	4	5

COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialized general knowledge, Skills Development
PREREQUISITE COURSES:	Computer Networks
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH (Instruction, Examination)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (in ENGLISH)
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning outcomes

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

Consult Appendix A

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

The purpose of the course is to provide a deeper understanding of embedded systems which can be defined either as a simple control system or as a complex computing system designed to perform a specific set of tasks. The course consists of two parts that are closely related. The first part analyzes systems based on microelectronics and their programming, while the second one is dedicated to systems using FPGA, ASIC, SoC, etc. technologies with emphasis on system design using hardware description language (VHDL, Verilog).

Upon completion of the course students will be able to:

• Understand the special characteristics that distinguish embedded systems from general-purpose computing systems.

• To evaluate and classify the various embedded systems based on their functional characteristics, the technologies that are using, etc.

• Evaluate and compare real-time operating systems.

• To apply methodologies of analysis, design, and development of embedded systems.

• Design and program platforms based on microcontrollers and their peripherals.

• Analyze and evaluate the performance of embedded systems based on preset time constraints.

• Create testbench implementations using hardware description languages.

• Design medium and high complexity hardware systems using hardware description languages.

• Understand advanced concepts in the design of embedded systems and apply them to platforms that use FPGA, ASIC, and SoC.

General Competences

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

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

• Retrieve, analyze and synthesize data and information, with the use of necessary technologies
• Working independently
• Teamwork
• Decision making
• Work in an interdisciplinary environment
• Produce new research ideas
• Promote free, creative and inductive thinking

(3) SYLLABUS

• Categorization and architecture of Embedded Systems
• Real time operating systems
• Performance analysis and optimization procedures
• Integrated environments for SW/HW development
• Hardware description languages (VHDL, Verilog)
• Embedded software design (C compilers, HDL)
• ASIC, FPGA, PLD Technologies
• Validation and evaluation methodologies for FPGA/ASIC systems
• Digital circuit design

(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	• Use of ICT in Course Teaching • Use of the Open eClass system, with uploaded notes, lectures, exercises for practice and communication with students • Practical exercises based on Microcontrollers and FPGA equipment.
TEACHING METHODS The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc. The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS	**Activity** / **Semester workload** Lectures: 39 Labs: 13 Project: 20 Independent Study: 53 **Total**: **125**
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other Specifically-defined evaluation criteria are given, and if and where they are accessible to students.	**I.** Written exams (accounts 80% of the total course mark) which consist of: - Short answer questions - Multiple choice questions - Real-life problems resolution **II.** Lab Projects (accounts 20% of the total course mark) For successfully qualifying the course, a minimum grade of 5.0 marks (of 10 in total) is mandatory in the written exams.

Activity	Semester workload
Lectures	39
Labs	13
Project	20
Independent Study	53
Total	**125**

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Οι Υπολογιστές ως Συστατικά Στοιχεία, Wayne Wolf Εκδόσεις Νέων Τεχνολογιών, 2008.
2. Σχεδιασμός Ψηφιακών Συστημάτων σε FPGAs, Wayne Wolf Εκδόσεις Νέων

Τεχνολογιών, 2013.

3. Σχεδιασμός κυκλωμάτων με την VHDL, Volnei A. Pedroni, Εκδόσεις Κλειδάριθμος,2008
4. FPGA Design, Best Practices for Team-based Design, Philip Simpson, Springer NY,2010
5. Application-Specific Mesh-based Heterogeneous FPGA Architectures, Husain Parvez Habib Mehrez, , Springer NY,2011