GENERAL

SCHOOL	School of Sciences		
ACADEMIC UNIT	Department of Computer Science		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	606SKOE	**SEMESTER**	6
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	2	5
Lab Exercises	1	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific Area, Skill Development
PREREQUISITE COURSES:	105 and 205
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek, English (for erasmus students)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

(1) LEARNING OUTCOMES

Learning outcomes

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

Consult Appendix A

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

Upon successful completion of the course, students should be able to:

1. To know the ways of using the materials used in the design of analog electronics of an integrated system, such as resistors, capacitors, coils, diodes, transistors, relays, operational amplifiers and timers.
2. To know the ways of using the materials used in the design of digital electronics of an integrated system, such as logic gates, encoders, decoders, multiplexers, decoders, digital comparators, flip-flops, counters and registers.
3. To know the architecture with which a RAM memory and a ROM memory are structured.
4. To understand the concepts and architectures of the following units of the microcontroller: 1. control unit, 2. microprocessor, 3. memory, 4. input unit and 5. output unit.
5. To specialize their knowledge in the architectural structure of the ATMEL AVR microcontroller.
6. To understand and use the way of writing instructions in Assembly language.
7. Know and be able to use the methodology and tools used to program a microprocessor in Assembly language.

8. To know how to program, in Assembly language, the Atmega8515 microcontroller.

9. Know how to design and develop a complete integrated system.

10. To get to know the SysML language for modeling complex systems that have characteristics of embedded systems and Internet of Things systems.

11. To know industrial systems of embedded systems.

General Competences

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

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

- Search, analysis and synthesis of data and information, using the necessary technologies
- Project planning and management,
- Promotion of free creative and inductive thinking.

(2) SYLLABUS

1. Introduction to analog and digital electronics used in embedded systems.
2. Introduction to Microcontrollers.
3. The architectural structure of AVR microcontrollers.
4. The ATmega8515 microcontroller and the memory, I/O and timer subsystems.
5. Design and implementation of a microcontroller system.
6. Programming the ATmega8515 microcontroller in Assembly and C language.
7. Connection of input and output devices, LED indicators, audio devices and medium and high current devices.
8. PWM pulse width modulation.
9. Motor control with PWM signals.
10. Digital to analog conversions.
11. Using PID control with microcontroller.
12. Assembly and C language application programs.
13. Modeling complex systems with SysML.

(3) 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*	Presentation with the help of slides, Course website with supporting and auxiliary material, Contact by e-mail
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-*	

Activity	Semester workload
Lectures	26 x 2= 56 h
Tutorial Exercises: Selected, representative exercises are solved concerning different modules of the course.	13 x 2= 26 h
Written Exams	2 x 1= 2 h

directed study according to the principles of the ECTS	Exercises	20 h
	Individual Study	125 x 0,2= 25 h
	Course total	125 h (5 ECTS)
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Final written exam (60%) including theory questions and problem solving topics Delivery of individual or group semester study (40%). The final examination of students with dyslexia takes place after consultation.	

(4) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. «Ενσωματωμένα Συστήματα», Δ. Πογαρίδη, Εκδόσεις ΔΙΣΙΓΜΑ, 2015.
2. «Ενσωματωμένα συστήματα - Ο αθέατος ψηφιακός κόσμος», Δασυγένης Μηνάς, Σούντρης Δημήτριος, https://repository.kallipos.gr/handle/11419/2247
3. «Ανάπτυξη Εφαρμογών με το Arduino», Π. Παπάζογλου, Σ. Π. Λιωνής, Εκδόσεις Τζιόλα.
4. «Embedded C programming and the Atmel AVR», R. Barnet, L. O'Cull, S. Cox, Thomson Delmar Learning Inc., 2007.
5. «Embedded Systems Design», A.S. Berger, CPM Books, 2002.
6. «Embedded System Design», F. Vaahid, T. Givargis, John Wiley @ Sons Inc., 2002.
7. «Microcontroller Technology», P. Spasov, Prentice Hall, 1993.

«A Practical Guide to SysML, The Systems Modeling Language» by Sanford Friedenthal, Alan Moore, Rick Steiner, Morgan Kaufmann Publishers.