COURSE OUTLINE

(1) GENERAL

SCHOOL	Economics, Management and Informatics		
ACADEMIC UNIT	Department of Informatics & Telecommunications		
LEVEL OF STUDIES	MSc		
COURSE CODE		**SEMESTER**	3rd
COURSE TITLE	Dependable and energy efficient computing		
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**
	Total	3	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Mix of general and special background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	-		
COURSE WEBSITE (URL)	https://eclass.uop.gr/courses/DIT131/index.php		

(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*

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

- Describe the concepts of dependable and energy efficient computing and the requirements that relevant systems should satisfy.
- State the dependability requirements for a system.
- Describe the types of errors, faults and hazards in a system and the ways of tackling them, and to select appropriate handling techniques.
- Describe and apply reliability analysis methods.
- Describe and apply techniques for fault avoidance, fault elimination and fault tolerance in software and hardware.
- Describe and apply reliability assessment methods
- Understand the energy requirements of a system
- Understand the main sources of energy dissipation of a system
- Describe and apply energy/power software optimization techniques
- Describe and apply energy/power hardware optimization techniques
- Describe and apply system level energy/power optimization techniques

General Competences

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

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

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

(3) SYLLABUS

- Introduction to fault tolerance and dependability
- Fundamentals of dependability
- Dependability evaluation techniques
- Reliability requirements.
- Reliability analysis.
- Hardware redundancy
- Information redundancy
- Time redundancy
- Faults and software.
- Software fault avoidance in specifications and design
- Software fault elimination.
- Software fault tolerance.

- Reliability assessment.
- Introduction to low power design
- Basic low power digital design
- Power efficient processor architecture
- Power efficient memory and cache
- Power aware operating systems, compilers and application software
- Low power graphics processors
- System-Level Design Techniques for Energy-Efficient Embedded Systems

(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 presentations Course Management System for Asynchronous eLearning via web browser (e-class)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	The language of evaluation is English. The performance evaluation will be with written exams at the end of the semester. It is possible that home assignments will be given, which will contribute to the final grade with a percentage ranging between 20% and 30%. The written exams will include a mix of problem solving, multiple choice and short-answer questions. The home assignments can include problem solving, public presentation, report writing.

Activity	*Semester workload*
lectures	39 hours
study	83 hours
exams	3 hours
Course total	**125**

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Fundamentals of Dependable Computing for Software Engineers, John Knight, CRC press, 2012.
- Fault-Tolerant Design, Elena Dubrova, Springer, 2013
- Building Dependable Distributed Systems, Wenbing Zhao, Willey publications
- Developing Green Software, Dr. Bob Steigerwald and Abhishek Agrawal, Intel Corporation
- Dependability benchmarking for Computer Systems, Karama Kanoun and Lisa Spainhower (eds), Willey publications & IEEE Computer Society
- Dependable Computing: Design and Assessment, Ravishankar K. Iyer, Zbigniew T. Kalbarczyk, Nithin M. Nakka, Wiley, 2016

- Dependable computer systems, Assen V. Krumov, CreateSpace Independent Publishing Platform, 2013
- Computer Architecture Techniques For Power-Efficiency, Stefanos Kaxiras and Margaret Martonosi, Morgan & Claypool, 2008
- System-Level Design Techniques For Energy-Efficient Embedded Systems, Marcus T. Schmitz, Bashir M. Al-Hashimi and Petru Eles, Springer 2009
- Power-efficient System Design, Preeti Ranjan Panda, B. V. N. Silpa, Aviral Shrivastava, Krishnaiah Gummidipudi, Springer 2010
- Low power design essentials, J. Rabaey, Springer 2009