COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Department of Computer Engineering & Informatics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	NY163	SEMESTER	1st
COURSE TITLE	Digital Design I		

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 and tutorials	4	4
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*	Specialized general knowledge Skills development
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	http://pc-vlsi18.ceid.upatras.gr/logic_design_i.html

(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*

Upon successful completion of the course, a student will be able to :

(1) set up a truth table for representing the desired operation of a circuit,
(2) develop a minimal logic circuit implementing this truth table using simple logic gates,
(3) provide a block diagram of a circuit implementing the desired operation using MSIs, and
(4) use an HDL for expressing either the desired operation of a target circuit or an implementation of the target circuit and simulate it.

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

Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas

(3) SYLLABUS

- Analog vs Digital
- Sampling and Quantization
- Binary Signal
- Representation using binary signals
- From logic sentence algebra to switching algebra and Boolean algebra
  - What makes up an algebra
  - Variables, operators and operator precedence in Boolean Algebra
  - Boolean algebra axioms
  - Boolean algebra theorems
- Expression minimization by algebraic operations
- Digital gates
  - AND, OR and NOT gates
  - Logic diagram
  - AND and OR gates with multiple inputs
  - NAND, NOR, XOR and XNOR functions and the corresponding gates
- Standard and non-standard representations of logic functions
  - Terms, sums, products, SOP and POS forms, canonic terms, minterms and maxterms.
  - The equivalence between a truth table and the sum of minterms or the product of maxterms
  - Going from one of the canonic forms into the other and into the canonic forms of the complementary function
- K-map minimization method
- Quine-McClauskeyminimization method
- HDLs : The philosophy behind a parallel language and their use in simulating and synthesis of digital circuits
- The Verilog HDL
  - Structural description methods
  - Equation description method
  - Hierarchical description
  - Behavioral description
  - Testbench development and the use of the simulator
- Combinational MSIs
  - Half-adder
  - Full-adder
  - Ripple-carry parallel adder
  - CLA parallel adder
  - Comparators
  - Multipliers
  - Decoders – Demultiplexers. Using decoders for logic function implementation.
  - Encoders and priority encoders.
  - Multiplexers. Using multiplexers for logic function implementation.
- Tri-state elements.
- The information provided by a Data Book.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Wide use of ICT and more specifically :
· The course is backed up by a web page providing all course material. This page is duly updated.
· Homeworks are announced electronically through this page, submitted also through this page and marking for them is also announced electronically
· The preferred communication method with the students is email.</td></tr>
<tr><td>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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>26 hours</td></tr>
<tr><td>Tutorials</td><td>26 hours</td></tr>
<tr><td>Homeworks</td><td>30 hours</td></tr>
<tr><td>Study</td><td>34 hours</td></tr>
<tr><td>Exams</td><td>3 hours</td></tr>
<tr><td>Course total</td><td>119 hours</td></tr>
</table>
</td></tr>
<tr><td>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.</td><td>The evaluation is performed in Greek language and is based on homeworks and a final written test that includes multiple choice questions, short-answer questions and problem solving.

Sample solutions to the written test are announced to provide students with a reference point for their marking. After the test marks are announced the students have the opportunity to see their mistakes.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

· Digital Design, Mano Morris, Ciletti Michael
· Digital Logic Circuit Analysis & Design, Nelson Victor P., Nagle H. Troy, Irwin J. David, Carroll Bill D.
· Digital Design, Dally William, Harting Curtis P.
· Logic and Computer Design Fundamentals, 5th edition, Morris Mano, Charles R. Kime, Tom Martin

- Related academic journals:

· IEEE Transactions on Computers
· IEEE Transactions on Circuits and Systems
· IEEE Transactions on VLSI Systems
· IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems