

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	SSE805-2023	SEMESTER	9th Semester
COURSE TITLE	Digital circuits and systems		
TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.		TEACHING HOURS PER WEEK	ECTS CREDITS
		3	6.0
COURSE TYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area		
PREREQUISITES			
TEACHING & EXAMINATION LANGUAGE:	Greek		
COURSE OFFERED TO ERASMUS STUDENTS:	YES		
COURSE URL:	https://exams.emt.ihu.gr/modules/auth/courses.php		

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
The course aims to familiarize students with: • A detailed understanding of the theory of logical design of synchronous and asynchronous sequential circuits. • The analysis and optimal design of synchronous sequential circuits. • The analysis and design of counters and registers. • An in-depth understanding of the operation of basic types of memories (RAM, ROM) and programmable logic structures (PLAs, PALs, PLDS, FPGAs). • The design of digital circuits at the register level. • The analysis and design of asynchronous sequential circuits. Upon completion of the course, the student will: • Have acquired an extensive theoretical background in the logical design of sequential circuits. • Be able to apply techniques and methods for: a) the analysis and b) the optimal design (minimization and coding of states) of

synchronous sequential circuits.

- Will be able to design counters and registers according to the needs of the applications.
- Will have a deep understanding of the concepts and methods for designing circuits at the register level.
- Will be able to apply techniques and methods for deriving the architecture and control circuit at the register level.
- Will know the operation of basic types of memories (RAMs, ROMs) and basic programmable logic structures (PLAs, PALs, PLDs, FPGAs) and their special characteristics.
- Will be able to: a) analyze the operation of asynchronous sequential circuits and b) apply techniques and methods of minimizing and coding states for the design of asynchronous sequential circuits without problems of races and hazards.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use, Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas

Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Decision making
Autonomous work
Teamwork

3. COURSE CONTENT

- Modern Sequential Logic: Analysis of modern sequential circuits (Equations, state tables and diagrams), State minimization and coding, Finite state machines (Mealy & Moore machines), Design process (State and excitation tables, Design with JK, T, D flip-flops). Design examples.
- Registers and counters: Shift registers (Parallel/serial loading, bidirectional registers etc.), Burst counters, Synchronous counters, Counters with unused states, Ring counters.
- Memory and programmable logic: Random access memory-RAM (read/write, timing, memory types), Memory decoding, Error detection and correction, Read-only memory (ROM), Programmable logic (PLAs, PALs, PLDs, FPGAs).
- Register-level design: Introduction and terminology, Algorithmic state machines (ASM diagrams, simplification, timing), Control logic circuit, Multiplexer design, Chase-free design, Design examples.
- Asynchronous sequential logic: Introduction, Analysis process (transition and flow tables, chase conditions, stability), Latched circuits, Design process, State minimization, State coding to avoid chase and spark problems.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students

TEACHING ORGANIZATION

The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Lectures	55
Tutoring	30
Writing project	25
Bibliographic research & analysis	40
Total	150

STUDENT EVALUATION

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

Student evaluation languages

Greek
English

Method (Formative or Concluding)

Formative

Student evaluation methods

Written Assignment
Written Exam with Problem Solving

Rate

50
50

5. Suggested Bibliography

- Σχεδίαση Λογικών κυκλωμάτων και Υπολογιστών (2016), 5η Έκδοση, Morris Mano, Charles R. Kime, Tom Martin, [59384943], Διαθέτης (Εκδότης): Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
- Ψηφιακή Σχεδίαση (2018), 6η Έκδοση, Mano Morris, Ciletti Michael, [68406394], Διαθέτης (Εκδότης): Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε.
- Ψηφιακή Σχεδίαση (2015), 1η Έκδοση, WILLIAM J. DALLY, R. CURTIS HARTING, [32998377], Διαθέτης (Εκδότης): ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ – ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ
- Συναφή επιστημονικά περιοδικά:
- Journal of Circuits, Systems and Computers ISSN (print): 0218-1266 | ISSN (online): 1793-6454
- Science Journal of Circuits, Systems and Signal Processing ISSN Print: 2326-9065, ISSN Online: 2326-9073

Eudoxus

Βιβλίο [18548949]: Ψηφιακά Ηλεκτρονικά ., Kleitz W. Λεπτομέρειες

Βιβλίο [18548697]: Ψηφιακά Ηλεκτρονικά, Leach, Malvino Λεπτομέρειες

Βιβλίο [133024408]: Ψηφιακή Σχεδίαση, 2η Βελτιωμένη Έκδοση, Ρουμελιώτης Μάνος, Σουραβλός Σταύρος Λεπτομέρειες