UNIVERSITÀ DEGLI STUDI DI PALERMO

SCHOOL	POLYTECHNIC SCHOOL
ACADEMIC YEAR	2016/2017
FIRST CYCLE COURSE	BIOMEDICAL ENGINEERING
SUBJECT	DIGITAL SYSTEMS ELECTRONICS
TYPE OF EDUCATIONAL ACTIVITY	D
AMBIT	10437-A scelta dello studente
CODE	02954
SCIENTIFIC SECTOR(S)	ING-INF/01
HEAD PROFESSOR(S)	GIACONIA GIUSEPPE Professore Associato Univ. di PALERMO COSTANTINO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
YEAR	3
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**GIACONIA GIUSEPPE COSTANTINO** Monday 11:00 12:00 DEIM: Stanza U217 Tuesday 11:00 12:00 DEIM: stanza U217

DOCENTE: Prof. GIUSEPPE COSTANTINO GIACONIA

TEACHING METHODS	Lectures, Lab. exercises. Activities are organized in order to facilitate the achievement of the expected learning outcomes. In details, the contents of the course are offered through frontal lectures and guided lab exercises. The lectures are supplemented by exercises during which the student can gradually apply the theoretical principles to the practical solutions, thus stimulating 'the development of the capacity' of application of knowledge and skills' acquired. All the activities of the course ultimately contribute to the development of learning skills, through the revision of the acquired knowledge.
ASSESSMENT METHODS	Lab assessment and oral examination, grading from 18 to 30 (out of 30). The student must primarily pass a laboratory assessment, usually at PC Lab of Polytechnic School, where in a predefined time interval (usually from 90 up to 120 minutes) he must use methods learned during the course and correctly solve a proposed design. This assessment must reach a minimum of 18 (out of 30) in order to get access to the oral examination, otherwise the student must repeat the lab assessment at later date. During the oral examination the student is asked to answer at least 3 questions chosen among the topics of the course syllabus. The exam is designed to test the acquired knowledge, the planning and solving ability, the presentation skills and the use of appropriate technical language of the student. The assessment is based on the following grades: a) excellent (30-30 cum laude): excellent knowledge of the topics, excellent use of technical language, good analytical ability, the student is able to apply knowledge to solve the proposed problems; b) very good (26-29): good knowledge of the topics, good use of technical language, the student is able to apply knowledge to solve the proposed problems; c) good (24- 25): basic knowledge of the main topics, discrete use of technical language, limited ability to independently apply the knowledge to the solution of the proposed problems; d) satisfactory (21-23): the student knows the main topics but has not a full grasp of them, satisfactory use of technical language, poor ability to independently apply the acquired knowledge; e) sufficient (18-20): minimal knowledge of the main topics and basic use of technical language, very little or no ability to independently apply the acquired knowledge; f) insufficient: the student does not have a minimum acceptable knowledge of the contents of the topics covered in the course.
LEARNING OUTCOMES	Knowledge and ability 'to understand The course tends to focus the study of the instruction based programmable electronic systems (microprocessor and microcontrollers) The study will deepen the knowledge on electronic devices needed to understand functionalities of a processor based system (memory, I/O interfaces and communication techniques between them and the CPU) Applying Knowledge and Understanding The student will mature knowledges on programming techniques of embedded systems through direct experience in the laboratory. The student will also acquire capabilities to analyze circuit aspects of a microprocessor system. Making judgments The student will mature capability to autonomously analyze a medium complexity digital system, fully understanding its functionalities by starting from the board layout and the firmware description loaded into the memory of the designed system. Communication skills The student will be able to sustain a technical discussion, at intermediate level, on programmable electronic systems used in modern electronics, thank to his basic knowledge on circuit layout and firmware related matter. Learning ability All the knowledge gained during the course are primarily aimed at providing students with the essential tools to autonomously work and understand complex issues, normally carried out within a second level course (laurea Magistrale) or that may be met in daily work.

EDUCATIONAL OBJECTIVES	The course tend to focus on the analysis of the main programmable electronics systems: low end microprocessor and microcontroller for embedded applications. Student are introduced to methods and programming languages of microcontroller systems-
PREREQUISITES	Good understanding of the topics covered in the former courses of " Calcolatori Elettronici", Electrical Devices and Circuits, an basic Electronics.
SUGGESTED BIBLIOGRAPHY	• Notes, handouts and other useful articles or web link given by the instructor through the student portal • G.Baccolini C.Offelli: Microelaboratori, note di hardware. - Citta' Studi Edizioni. • M.M.Mano, C.R. Kime: Logic and computer design fundamentals. - Prentice Hall ed.

SYLLABUS

Hrs	Frontal teaching
4	Introduction to complex digital systems. Comparison between fixed digital logic design and programmable logic.
8	A classic microprocessor system. Bus structure description and functional bus partitioning. Analysis of dynamic signals in a bus. General Architecture of a CPU: pinout and control signals description. Timing of most important machine cycles. Internal registers characteristics and instructions set knowledge. Stack management, code generation and address modes.
8	Introduction to memories: non volatile memories (ROM, PROM, EPROM, EEPROM, FLASH). Principles of operation, characteristics and features. Dynamic memories: working principle, reading writing cycles and refresh. Memory decoding granularity. Main memories decoding techniques.
8	I/O devices: definition of isolated I/O and mapped I/O. Introduction to handshake communication techniques. Peripheral management techniques: polling and interrupt schemes. parallel and serial communication of a microprocessor system.
10	general characteristics of a microcontroller and its comparison with a microprocessor. 8 bit microcontrollers for embedded application. Block diagram, memory organization and programming model. Instruction set and comparison between CISC and RISC architectures.

Hrs	Practice
16	Lab exercises on small programmable electronics system, through suitable demo board. Realization of simple coding with low level and high level languages in order to implement simple FSM and/or data filtering techniques.