UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2016/2017
BACHELOR'S DEGREE (BSC)	COMPUTER AND TELECOMMUNICATION ENGINEERING
INTEGRATED COURSE	COMPUTER FUNDAMENTALS - INTEGRATED COURSE
CODE	18073
MODULES	Yes
NUMBER OF MODULES	3
SCIENTIFIC SECTOR(S)	ING-INF/05
HEAD PROFESSOR(S)	GENTILE ANTONIO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	GAGLIO SALVATORE Professore Ordinario Univ. di PALERMO COTTONE PIETRO Professore a contratto Univ. di PALERMO GENTILE ANTONIO Professore Associato Univ. di PALERMO
CREDITS	18
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**COTTONE PIETRO** Monday 09:00 11:00 Edificio 6, terzo piano, laboratorio di Intelligenza Artificiale e Sistemi Distribuiti Friday 15:00 17:00 Edificio 6, terzo piano, laboratorio di Intelligenza Artificiale e Sistemi Distribuiti **GAGLIO SALVATORE** Wednesday 11:00 13:00 Dipartimento di Ingegneria - Sezione DINFO Ed. 6 **GENTILE ANTONIO** Friday 10:00 12:00 Studio del docente presso DINFO, Edificio 6, III pianoDietro prenotazione per email/sito o telefono: 091-238.62603

DOCENTE: Prof. ANTONIO GENTILE

PREREQUISITES	None
LEARNING OUTCOMES	Conoscenza e capacita di comprensione Lo studente acquisira approfondita conoscenza della programmazione strutturata in linguaggio C. Conoscera i principali strumenti di programmazione. Acquisira elementi di rappresentazione delle informazioni nei calcolatori e metodologie di base per la progettazione e l'analisi di reti logiche combinatorie e sequenziali. Lo studente acquisira conoscenze di base sulle architetture dei calcolatori e sui sistemi operativi Unix-like. Capacita di applicare conoscenza e comprensione Lo studente sara in grado di valutare le possibili soluzioni software a problemi di complessita media e affrontarne l'implementazione utilizzando strumenti e ambienti di sviluppo per la programmazione in linguaggio C in ambienti Unix-like. Sara in grado di affrontare semplici problemi di rappresentazione binaria delle informazioni. Sara in grado di progettare a livello funzionale circuiti logici per la soluzione di semplici problemi. Autonomia di giudizio Lo studente sara in grado di affrontare in autonomia l'analisi, la progettazione e l'implementazione di software utilizzando la programmazione strutturata. Sara in grado di valutare la qualita del software in termini di semplicita, leggibilita, strutturazione, efficienza e riutilizzabilita. Abilita comunicative Lo studente sara in grado di esporre, efficacemente e con proprieta di linguaggio, analisi e soluzioni di problemi affrontabili con la programmazione strutturata e con la progettazione funzionale di circuiti logici, nonche di problemi di rappresentazione delle informazioni. Capacita d'apprendimento Lo studente sara in grado di affrontare in maniera autonoma problemi di programmazione strutturata individuando e integrando soluzioni parziali gia disponibili, sia formalizzate sia implementate. Sara in grado di approfondire in autonomia la conoscenza di moduli software e interfacce di programmazione. Sara in grado di approfondire la conoscenza dei linguaggi e paradigmi di programmazione, dei sistemi operativi, delle architetture dei calcolatori e dei circuiti logici.
ASSESSMENT METHODS	The acquired knowledge and competence of the student will be verified by means of a final written test. The final test can be substituted by partial written tests during the year. Each written test will concern the implementation of a computer program in the C language, according to the methodology of iterative refinements, characteristic of structurate programming. The tests aim to verify the knowledge of the student regarding the topics treated within the course and his capability to apply such knowledge. The evaluation will also consider the communication capability of the student, together with his judgement autonomy in proposing suitable solutions for the required application. The evaluation will be on a range from 18 to 30 cum laude.
TEACHING METHODS	Class lectures Lab and practice sessions

MODULE
BASIC COMPUTER ARCHITECTURE

Prof. ANTONIO GENTILE

SUGGESTED BIBLIOGRAPHY	
1. Andrew S. Tanenbaum, Architettura dei calcolatori un approccio strutturale, quinta edizione, Pearson-Prentice Hall	
AMBIT	50283-Matematica, informatica e statistica
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
EDUCATIONAL OBJECTIVES OF THE MODULE	
At the end of this class the student will be able to address computer organization concepts and their historical evolution. He/she will master the basic concepts and structures of programmable digital computers. S/he will learn how to use assembly language to program the LC-3 architectures	

SYLLABUS

Hrs	Frontal teaching
6	Programmable computers. History and evolution. Computer organization. The Von Neumann architecture: CPU, memory, I/O. Microprocessors. Discussion.
6	Information representation. Signed numbers and 2's complement representation. Fixed and floating point representation. ASCII and UNICODE character representations. Discussion.
6	Introduction to VHDL. Schematic entry vs. VHDL. Timing diagram and simulation. Structural, dataflow and behavioural descriptions. Sequential circuit descriptions in VHDL.
6	VHDL models of hardware structures. Implementation of combinational circuits: multiplexers, demultiplexers, decoders, encoders, adders and multipliers. Implementation of sequential circuits: Mealy and Moore models, ASM, registers and counters, memory banks. Discussion
6	Deeper on the Von Neumann architecure and its constituent components. The LC-3 architecture. Instruction cycle. Reordering and flow control. Discussion
6	The ISA. Computation and data movement instructions. Flow control instructions. The datapath revisited. Discussion
6	Introduction to assembly. Problem solving techniques. basic constructs: sequences, conditional statements and iterative instructions. Debugging. Writing a program in assembly. Two-phase assembly process. Object files linking. Examples and discussion
6	The stack. Basic structure. I/O and interrupts. Reverse Polish Notation and data conversion. Examples and discussion

Hrs	Practice
6	Implementing the LC-3 architecture in VHDL, using behavioral description.

MODULE **LOGIC CIRCUITS**	
Prof. PIETRO COTTONE	

SUGGESTED BIBLIOGRAPHY
1. M. Morris Mano, Charles R. Kime, "Reti Logiche", Ed. Italiana, Pearson Education 2. Y. Patt, S. Patel, "Introduction to Computing Systems: From bits & gates to C & beyond", 2nd Ed., McGraw-Hill 3. D. A. Patterson, J. L. Hennessy, "Computer Organization and Design", Morgan Kaufmann

AMBIT	50283-Matematica, informatica e statistica
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54

EDUCATIONAL OBJECTIVES OF THE MODULE
At the end of this class the student will be able to address computer organization concepts and their historical evolution. He/she will master the basic concepts about Boolean algebra and digital computation circuits. S/he will learn how to design and implement digital computation circuits and sequential circuits.

SYLLABUS

Hrs	Frontal teaching
6	Programmable computers. History and evolution. Computer organization. The Von Neumann architecture: CPU, memory, I/O. Microprocessors. Discussion
6	Signed numbers and 2's complement representation.Internal and external representations. Numbering systems: binary, octal, and hexadecimal bases, conversions. Codes. ASCII and UNICODE character representations. BCD codes.
6	Boolean algebra. Logical operators and gates. Boolean functions and truth tables. Diagrams and circuits. Identities. Duality principle. De Morgan Theorem. Complement and dual. Canonical expressions. Minterms, maxterms. Discussion
6	Two-level functions and synthesis. Karnaugh maps: 2-, 3-, 4- varibales maps. Implicants, Prime Implicants, Essential implicants. Minimal form. XOR and XNOR. Functionally complete operators: NAND, NOR. Discussion
6	Basic corcuits. Decoder ed encoder. Series expansion. Priority encoders. Multiplexer and demultiplexers. Synthesis using decoders, multiplexers. Adders. Discussion
6	Sequential circuits. Mealy and Moore models. Latches and Flip-flops. Analysis of synchronous seqential circuits. Synthesis of synchronous seqential circuits. Discussion
6	Memories and logic programmable circuits. Introduction and general operation. Read-only memories. Digital logic implementaion using ROMs. Programmable array logic. Programmable logic arrays. Introduction to Field-programmable gate arrays (FPGA).

Hrs	Practice
12	Practice sessions on class topics

MODULE
PRINCIPLES OF PROGRAMMING

Prof. SALVATORE GAGLIO

SUGGESTED BIBLIOGRAPHY	
P. Deitel, H. Deitel, "Il Linguaggio C – Fondamenti e tecniche di programmazione", Ottava edizione, Pearson Italia, 2016.	
AMBIT	50283-Matematica, informatica e statistica
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
EDUCATIONAL OBJECTIVES OF THE MODULE	
Objective of the module is to provide the student with the basic concepts of computer programming. The main topics treated in the course concern the development of programs through successive refinements, according to the technique of structured programming with the use of the C language, in order to realize concrete applications. The approach will be oriented to the construction of algorithms and to data structuring and management.	

SYLLABUS

Hrs	Frontal teaching
2	Introduction to the module. Introduction to computers, the internet and the web.
2	Introduction to C programming: Arithmethics and decision.
2	Structured program development in C.
2	C program control.
4	C functions and recursion.
4	C arrays, search and sorting.
4	C pointers.
2	C characters and strings.
2	C formatted input/output.
2	C structures, unions, bit manipulation and enumerations.
2	C file processing.
4	C data structures.
2	C preprocessor and advanced topics.
2	Sorting and efficiency of an algorithm.

Hrs	Practice
2	Introduction to the use of the command line and to the development environments.
4	Structured program development in C.
4	Program development in C for manipulating vectors and matrices.
4	Program development in C using pointers.
4	Program development in C for data structure management.