UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	ELECTRONIC ENGINEERING
INTEGRATED COURSE	COMPUTER FUNDAMENTALS - INTEGRATED COURSE
CODE	18073
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	ING-INF/05
HEAD PROFESSOR(S)	GAGLIO SALVATORE Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	GAGLIO SALVATORE Professore Ordinario Univ. di PALERMO GENTILE ANTONIO Professore Associato Univ. di PALERMO
CREDITS	12
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	Annual
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**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. SALVATORE GAGLIO

PREREQUISITES	Basic Math and Science skills learnt at the high school.
LEARNING OUTCOMES	Knowledge and understanding At the end of the course, the student will acquire both a good knowledge of information representation techniques and its processing through sequential and combinatorial networks, and a good knowledge of the optimization techniques of such systems. The student will also learn the syntax and programming techniques in C language, data structures and fundamental algorithms. Ability to apply knowledge and understanding The student will be able to apply the techniques studied to design combinational and sequential networks at a logical and functional level and analyze their functioning. The student will be able to use development tools and environments for programming in C language and will be able to implement software solutions. Autonomy of judgment The student will be able both to carry out the analysis of a problem and to design, starting from a verbal description, a suitable software solution. He will be able to evaluate the quality of a software solution in terms of simplicity, readability, efficiency and possibility of reuse. He will be able to understand how a computer works. Communication skills The student will acquire the ability to communicate and express problems relating to the subject of the course. He will be able to describe a logic circuit with appropriate terminology. He will be able, using a simple and clear language, to describe the analysis and synthesis processes of software solutions. Learning skills The student will have the ability to apply the methodologies studied in different contexts and to learn analysis and synthesis processes related to software programs in structured programming and logic circuits.
ASSESSMENT METHODS	Learning is assessed through two written tests that focus on the two modules of the course and a a possible oral interview. The written test concerning the topics of the Logic Networks module consists mainly in the answer to some questions with closed or open answers and in questions about the design of sequential and combinational circuits. The questions will tend to verify a) the acquired knowledge; b) the ability to design circuits that meet certain specifications, c) the ability to organize and display technical knowledge. The maximum score is obtained if the verification ascertains the full possession of the following three aspects: ability to carry out the questions concerning the representation of information, the ability to design or optimize logic circuits that perform specific tasks, the ability to describe and compare different circuit solutions. The written test on the topics of the Fundamentals of Informatics module will consist of programming exercises, relating to the generation of one or more C language programs, based on some technical specifications, and open-ended questions. The test will verify the knowledge of the C programming language, the ability to find solutions to simple problems typical of the discipline, the ability to implement running software, the knowledge of the topics covered during the course. The maximum score is obtained if the verification ascertains full possession of the following aspects: the use of language constructs in a syntactically correct way; the ability to compose constructs to solve problems concerning the acquisition, processing and storage of information; the generation of software that can run without malfunctions; full knowledge of the course topics. During the oral interview, the student must be able to discuss the solutions proposed during the written tests. The final grade will be calculated as the average of the evaluations of the 3 tests. The general assessment is based on the following general criteria: a) excellent (30 - 30 cum laude): excellent knowledge of the topics, excellent language properties, good analytical skills, the student is able to apply the knowledge to solve the proposed problems; b) very good (26 - 29): good command of the topics, full ownership of language, the student is able to apply the knowledge to solve the proposed problems; c) good (24 - 25): basic knowledge of the main topics, fair language properties with limited ability to autonomously apply the knowledge to solve the proposed problems; d) fair (21 - 23): limited command of the main teaching topics, fair language properties, fair ability to independently apply the acquired knowledge; e) sufficient (18 - 20): minimal basic knowledge of the main teaching topics and technical language, poor ability to independently apply the acquired knowledge f) insufficient: does not possess a minimum acceptable knowledge of the contents of the topics covered in the teaching.
TEACHING METHODS	Frontal lessons. Exercises and practice in the classroom.

MODULE
LOGIC CIRCUITS

Prof. ANTONIO GENTILE

SUGGESTED BIBLIOGRAPHY

1. M. Morris Mano, Charles R. Kime, Reti Logiche, III Edizione italiana, Pearson Education Italia, ISBN: 88-7192-142-9

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

EDUCATIONAL OBJECTIVES OF THE MODULE

The student will be able to apply the methodologies studied in different contexts and to learn analysis and synthesis processes related to logic circuits.

SYLLABUS

Hrs	Frontal teaching
12	Introduction to the course, the concept of information and its logarithmic nature. Representation of integers in a generic basis, binary numbers. Conversion of numbers from one base to another, representation of floating point numbers and negative numbers. Numerical representation of images and sounds, ASCII code. Introduction to Boolean algebra. Logic gates, Boolean functions, negated logic, theorems and properties of algebra, normal forms. Karnaugh maps, boolean function minimization. Synthesis of combinatorial networks. Integrated circuits (full adder, adders, multiplexers, decoders).
16	Sequential networks. Mealy and Moore models. Latches (SR, D), Flip-Flops (JK, T, D, SR). Master slave. Analysis and design of synchronous sequential circuits. State diagrams, Flip Flop characteristic equations, Design of sequential networks with Flip Flops of various types (D, T, JK, SR). Sequence recognizers. Registers, counters, ROM, PAL, PLA
8	Computer architecture (von Neumann model), CPU, ALU, RAM, BUS. What is a program. CISC and RISC systems. Microprograms and wired logic. Introduction to operating

Hrs	Practice
4	How to represent information. Boolean algebra
7	Analysis and Design of combinational networks. Karnaugh maps; Normal forms
7	Analysis and Design of sequential networks. Design of sequence recognizers

MODULE
PRINCIPLES OF COMPUTER SCIENCE

Prof. SALVATORE GAGLIO

SUGGESTED BIBLIOGRAPHY

P. Deitel, H. Deitel, "Il Linguaggio C – Fondamenti e tecniche di programmazione", Nona edizione, Pearson Italia, 2022.
ISBN-10 8891906239
ISBN-13 978-8891906236

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
1	Introduction to the module. Introduction to programming.
2	Algorithms, flow diagrams and the notion of computational complexity.
3	Introduction to C programming: compilation and linking.
3	Structured program development in C.
1	The C standard library and the preprocessor.
2	Operators and basic types in C.
3	C program control.
3	Procedures and C functions. Recursion.
6	C arrays, search and sorting.
3	C pointers.
3	Multidimensional arrays. C structures, unions, bit manipulation and enumerations.
3	C file processing.
3	Advanced topics. Complex data structures. Passing parameters to functions either by value or by reference.

Hrs	Practice
2	Introduction to the use of the command line and to the development environments.
8	Structured program development in C.
6	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.