



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè
ACADEMIC YEAR	2016/2017
BACHELOR'S DEGREE (BSC)	PHYSICS
SUBJECT	COMPUTER SCIENCE AND PROGRAMMING
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10699-Attività formative affini o integrative
CODE	13936
SCIENTIFIC SECTOR(S)	INF/01
HEAD PROFESSOR(S)	MICCICHE' SALVATORE Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	78
COURSE ACTIVITY (Hrs)	72
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	MICCICHE' SALVATORE Tuesday 15:00 17:00 Dipartimento di Fisica e Chimica, Viale delle Scienze, Ed. 18, Studio del docente. Gli studenti sono pregati di iscriversi tramite portale UNIPA. \ Department of Physics and Chemistry, Viale delle Scienze, Ed. 18, Lecturer's office. Students are requested to register through the UNIPA portal.

PREREQUISITES	The prerequisites are those established for access to the Degree in Physical Sciences and verified through the access test.
LEARNING OUTCOMES	Knowledge and Understanding. Acquisition of basic knowledge regarding: computer fundamentals ; representation of information in electronic computers ; data transmission protocols and INTERNET ; operating systems; algorithmics ; programming languages and their classification ; C language ; programming languages and evolved computing environments for the data analysis and the numerical and analytical calculations. Applying knowledge and understanding The student must be able to a) have a thorough knowledge of a personal computer , know how to use it, to write and file texts and tables ; b) needs to know how to organize experimental data, calculate quantities and create graphs related to them; c) must be able to surf the net and know how to search for information on the Internet; d) must be capable , once assigned to a computational problem , to identify the resolution algorithm and to act independently in order to develop the resulting program by means of its coding in C language, and subsequently to illustrate the results of the compilation and the linkage as well as the output of the execution; e) must be aware of the use of programming languages and evolved computing environments for the data analysis and the numerical and analytical calculations. Making Judgements To be able to assess how to organize autonomously its own knowledge in order to choose the most appropriate ways to use the appropriate software for writing and storing texts and tables, to know how to search for information on the INTERNET and develop programs in C. Communication skills To be able to illustrate in proper form the issues related to information processing and the algorithms that form the basis of structured programming in C. Learning skills To be able to continue pursuing independently the study and deepening of the operating systems and programming languages using the knowledge, abilities and skills developed during the course and to to apply them in the continuation of the activities of the degree course in Physical Sciences.
ASSESSMENT METHODS	The examination is divided into two parts: practical coding test at the computer and oral exam. The practice test with the computer consists in the realization of a simple code in C. The objective of this test is to verify that the student knows how to write a code in C, the code can be compiled and it solves even in an elementary way the assigned problem. The oral exam consists of a first part in which is carried a discussion of the C code constructed by the student, in order to highlight what are the parts that can be improved/optimized. The second part of the oral examination can focus on the discussion of an "assignment", i.e. of a problem usually of level more complex than those proposed in the practical test, which is given to any student at the end of the academic year and that the student performs in full independence from the teacher, possibly in collaboration with colleagues with whom he carried out the practical exercises in the lab during the academic year. Carrying out the assignment is optional. The discussion on the assignment aims to verify the degree of autonomy of the student and its ability to find new solutions to the proposed problems. The final marks will be scaled according to the following conditions: a) only basic knowledge of Programming and limited ability to expose subjects and the related derivations, just sufficient ability to expose and to analyze phenomena, problems and solutions (grade 18–21); b) good knowledge of Programming and good ability to develop analyses or derivations, good ability to expose and analyze phenomena as well as conceptual problems and related solutions (grade 22-25) c) deep (but not full) knowledge of the concepts and problems of Programming, detailed exposure and analysis, albeit with some uncertainty, of phenomena, problems and related solutions (grade 26-28); d) deep and full knowledge of the concepts and problems of Programming, full mastering exposure and analysis, even with original criticisms, of phenomena, problems and related solutions, in the best cases with original contributions and original analysis as well as with excellent ability to communicate (grade 29-30L);
EDUCATIONAL OBJECTIVES	

	Having an understanding of the IT procedures appropriate for the processing and analysis of experimental data and for the applications related to the modeling of physical processes as well as the ability to use them in the continuation of the course of studies in Physics. The learning of the C language C is essentially functional to the development of the students' capacities in terms of analysis and description of the solution algorithms of a physical problem.
TEACHING METHODS	Lectures in Classroom and in IT Laboratory During the lectures in classroom we will deal with basic concept of programming and the basic elements of the C language. During the lectures in laboratory we will perform simple coding activities in C language.
SUGGESTED BIBLIOGRAPHY	L.M. Barone, E. Marinari, G. Organtini, F. Ricci-Tersenghi, Programmazione scientifica, Pearson Education, ISBN: 88-7192-242-5. S. Ceri, D. Mandrioli, L. Sbattella, Informatica: Programmazione, McGraw-Hill, ISBN: 88-386-6287-8

SYLLABUS

Hrs	Frontal teaching
1	Introduction to the course. Informatics and algorithms.
1	Internet, how it was born and how it developed. Main procedures for accessing internet: telnet, ftp, ssh, scp,
1	The information processing systems and their classification. Personal computers and workstations.
1	Advanced Internet tools: World Wide Web; e-mail, client-server protocols. HTML language. Java applets.
1	Personal computer architecture. Bus, RAM, ROM and Cache memory. Storage memories. CPU.
1	Basic operation concepts of a personal computer.
1	Binary, octal and hexadecimal numbering systems.
1	Encoding of integers. Encoding real numbers in fixed and floating-point.
1	Encoding of characters and logical operators.
1	Encoding of images and sounds.
1	Operating systems. Algorithms and flow charts. Programming languages : Level-0 languages, level-1 languages or assemblers.
1	Level-2 languages or evolved languages. Interpreters and compilers. The compiler libraries. Stages of compilation and linkage: from the source code to the executables.
1	Object-oriented programming.
2	The C language. Lexical elements, keywords. Data types. Local and global variables and formal parameters. Arithmetic, logical and relational operators. The tables of values for logical and conditional expressions. Data Input and output to files. Libraries in C.
1	Arrays and strings.
1	Selection (If, Then , Else) , Iteration (Do , While , For) , Jump Instructions (continue , break , return) . Instructions with labels. Switch.
1	Applications: factorial, solving equations, prime numbers, issues with rounding.
1	Applications: bubble sort algorithm, solving systems of equations.
1	Specifiers & and pointer *. The assignment instructions.
1	Functions and functions overload.
1	Random number generation and related instructions. Seed of the sequence and related instructions
1	Introduction to: regression, numerical integration and solution of differential equations.
1	Advanced topics: MALLOC and STRUCT.
Hrs	Workshops
3	Basic elements of LINUX operating system.
3	Use of basic application software: xmgrace, nedit, excel, wget. TCP / IP and DHCP protocols.
3	Basic instructions in C: scanf, printf, getchar, sizeof. Usage of main ().
3	Array and strings in C.
3	Selection and iteration in C.
3	Pointers in C. Part 1.
3	Pointers in C. Parte 2.
3	Functions in C.
3	Bubblesort algorithm in C. Linear equations in C.
3	Factorial, prime numbers, roots of equations.
3	Random Numbers in C.
3	Shuffling and bootstrap.
3	Regression, numerical integration, differenzial equations.

Hrs	Workshops
3	Double pointer.
3	Dynamical memory allocation
3	Individual programming. Build a unique code that integrates the various modules developed during laboratory classes. Test it with data taken in other labs and display any graphics using xmgrace. Organize your code by creating appropriate libraries.