Brief Description

This module focuses on building software development skills using the C language. In particular, the module teaches the students how to approach a problem, to devise a computer-solvable solution, to implement it using C programming language and test it. It then introduces the concepts of functional decomposition ("sub-programs"), parameter passing (by value and by reference), structured data types, pointers, and the facilities of the C standard library. Example application areas include numerical analysis and cryptography.

Goals and Learning Outcomes

Having successfully completed this course, the student will:

- have acquired advanced development skills using the C language
- have learnt fundamental principles of functions, arrays, structured data types and pointers
- applied basic programming techniques for building numerical analysis and cryptography applications

Syllabus

PART ONE

- Introduction to Computers History, Software and hardware, Computer architecture, Storing information, Computer networks, Major services
- Software Engineering and Programming Data types, Variables, Expressions, Flow control, Applications, Compile, Link and Execute processes

PART TWO

- Functions Introduction, Definition, List of parameters, Return values, Function calls, Formal and actual parameters, “by-value” and “by-address” parameters, Local and global variables, Function declaration/prototype, Header files and libraries, Complex example, Laboratory exercises
- Arrays Introduction, Definition, Parsing, Complex example
- Strings Introduction, Definition, Input/Output, Using “string.h” library, Complex example
- Files Introduction, Operations with files, Complex example
- Structures Introduction, Definition, Simple example, Complex example, Laboratory examples
- Pointers Introduction, Definition, Simple example, Complex example, Laboratory examples
- Applications Numerical analysis, Cryptography, Structures handling, Pointer manipulation

Course Textbooks

Strongly recommended textbooks:

- Harvey Deitel, Paul Deitel, "C How To Program", Fourth Edition, Prentice Hall, Pearson Education, 2003, ISBN 013122543X
- Brian Kernighan, Dennis Ritchie, "C Programming Language", Second Edition, Prentice Hall, Pearson Education, 1998, ISBN 0131103628