Compléments de programmation et d'algorithmique

Lecturer
Jérémie ROLAND (Coordinator)

Course mnemonic
INFO-H304

ECTS credits
5 credits

Language(s) of instruction
French

Course period
First term

Campus
Solbosch

Course content

- C language:
  - Syntax and semantics
  - Manual memory allocation and deallocation; pointers
- C++ language:
  - Syntax and semantics, object oriented programming aspects
  - Templates and C++ Standard Template Library (STL)
- Basic analysis of algorithms:
  - Big-O, Omega and Theta notations
  - Notions of algorithm and complexity
  - Main complexity classes
- Data structures:
  - General principles
  - Linked lists
  - Priority queues, heaps
  - Binary search trees
  - Hash tables
- Sorting algorithms:
  - Insertion sort
  - Mergesort
  - Heapsort
  - Quicksort
  - Linear sort: counting sort and Radix sort
- Algorithmic strategies:
  - Divide-and-conquer
  - Backtracking
  - Dynamic programming
  - Greedy algorithms

Objectives (and/or specific learning outcomes)

- C and C++ programming:
  - to be able to write simple programs in C/C++
  - to understand and to use the basic principles of dynamic memory allocation
- Algorithms and data structures:
  - to be able to design algorithms for simple problems using the basic algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, etc.)
  - to be able to design and use elementary data structures adapted to these problems (arrays, linked lists, hash tables, binary search trees, etc.)
  - to be able to analyze the complexity of these algorithms

Pre-requisits and co-requisits

Pre-requisites courses

INFO-H2001 | Programmation orientée objet | 5 crédits

Course having this one as co-requisit

INFO-F201 | Systèmes d'exploitation | 5 crédits

Teaching method and learning activities

Theory courses supported by slides and computer demonstrations. Direct application on computer via a virtual machine

Exercice sessions: programming on computer but also some theoretical exercices on paper

Programming project on a given subject, in small groups of students

Contribution to the teaching profile

This teaching unit contributes to the following competences:

- Abstraire, modéliser et simuler des systèmes physiques complexes rencontrés dans les applications biomédicales (bioélectricité, biomécanique, écoulements, etc.)

- Se représenter les mécanismes biologiques fondamentaux depuis la biochimie de la cellule jusqu'au fonctionnement des principaux systèmes de la physiologie humaine
- Gérer, explorer et analyser les données médicales (dossier médical, imagerie, génomique, statistiques)

References, bibliography and recommended reading

- The C Programming Language (Second Edition), B.M. Kernighan and D.M. Ritchie, Prentice Hall (1988)
- The C++ Programming Language (Fourth Edition), B. Soustrup (2013)
- C++ for Java Programmers, M.A. Weiss (2003)
- Introduction to Algorithms (Third Edition), T.H. Cormen et al. (2009)

Course notes

Podcast and Université virtuelle

Other information

Place(s) of teaching

Solbosch

Contact(s)

Jérémie Roland (Jeremie.Roland@ulb.be)

Evaluation method(s)

Oral examination and Project

Evaluation method(s) (additional information)

- Continuous evaluation: programming project (5 points)
  - Group project on an imposed subject
  - Specifications communicated in October, including evaluation criteria
  - Intermediate deadline in November: code with basic functionalities
  - Final deadline in December: code with full functionalities + report
- Final evaluation: oral examination (15 points)
  - 1 question on algorithms (10 points)
  - 1 question on programming (5 points)
  - 45 minute answer preparation time: no access to course material, preparation of answers on blackboard
  - 45 minute answer presentation time

Determination of the mark (including the weighting of partial marks)

The project is graded on a total of 5 and the oral examination on a total of 15.

- If both grades are above half, the global grade is their sum.
- If one of the grades is below half, they are recalculated on a total of 20 and the global grade is the minimum of both grades.

In short, in order to validate the course, the student needs to validate both the project **and** the oral examination.

Reporting of a grade from one session to the next one can only be done for grades above half, in that case reporting is automatic. If the project was not validated in first session, it can be realized in second session. Students in this situation should contact the teacher to organize the delivery of the project in second session.

Main language(s) of evaluation

French

Programmes

Programmes proposing this course at the Brussels School of Engineering

BA-IRCI | Bachelor in Engineering Sciences | option Bruxelles/unit 3