

## Connaissances requises en informatique

### 1 - langages de programmation

1.1 (+) Programming in C. Functions in C (signature, plus return type), `if(cond){}else{}`, `for(_;_;_){}`, `while(cond){}` constructs. Base types (char, short, int, long, double), struct keyword. Pointers. Number and text representation in memory (unsigned and 2-complement, ASCII table principle).

1.2 (++) Programming in Java (and Object Oriented principles). Classes, methods, fields in Java language with scope (private/ public). Constructors (implicit and explicit), and object instantiation. Subtyping (extends keyword) principle and impact on field and method scopes, and object instantiation. Exception mechanisms (definition and usage -throws, try and catch keywords).

### 2 - General and Graph Algorithmics

2.1 (+) Data structures (stack, queues, linked list). Operations on data structures (element insertion, membership test, element retrieval).

2.2 (++) Recursive algorithms, and divide and conquer strategy to problem solving. Sorting algorithms (quick sort, fusion sort, heap sort, bubble sort, insertion sort). Sorting algorithm complexity (worst and average case). Data structures to store elements with ordering properties on insertion and retrieval (heap, balanced search trees, sorted queue), temporal complexity of insertion and retrieval operations.

2.3 (+) Graph algorithmics (undirected or directed). Graph, graph topology (degree, connectivity, paths). Shortest path algorithm.

2.4 (+++) Spanning tree, minimal spanning tree, flow analyses in graphs.

### **3 - Logics and language theory**

3.1 (+) Propositional logic, satisfiability, and rewriting rules (negation distribution over "or" and "and" operators, contraposition).

3.2 (++) Predicate and first order logic. Quantifiers (exists, and "forall"), and rewriting rules for first order logic.

3.3 (++) Language theory (regular languages). Regular expressions (language and syntax), finite state and alphabet automata .