Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MAT231	Algorithms and Advanced Programming I	3	1	1	1	3	3

Prerequisites	
Admission Requirements	

Language of Instruction	French
Course Type	Compulsory
Course Level	Bachelor Degree
Objective	The purpose of this course is to improve students programming capabilities by the study of some common algorithms, their implementations and their applications to sample computational problems.
Content	Programming review (with Python): variables and state, conditionals, loops, functions Basic data structures: list, multi dimensional array, tree Common algorithms: search, sort, aggregate functions Recursion: numeric computation, tree traversal (inorder/preorder/postorder) Algorithm Analysis: time/space complexity classes
References	Algorithmique - 3ème édition - Cours avec 957 exercices et 158 problèmes - Cormen, Leiserson, Riverst, Stein Problem Solving with Algorithms and Data Structures Using Python - Bradley N Miller and David L. Ranum The Art of Computer Programming - Donald Knuth Python - How to Program - Deitel Data Structures and Algorithms Using Python - Rance D. Necaise Data Structures and Algorithms with Object-Oriented Design Patterns in Python - Bruno R.Preiss

Theory Topics

Week	Weekly Contents
1	Introduction to algorithms, implementation of Euclidean division algorithm
2	Time Complexity Analysis: Largest and smallest divisor
3	Recusion
4	Data structures I
5	Data structures II
6	Data structures III
7	Sorting Algorithms: Time complexity and applications I
8	Midterm
9	Sorting Algorithms: Time complexity and applications II
10	Abstract Data Types
11	Trees
12	Numerical algorithms: random number generation, root finding
13	Search: simple search, binary search, searching recursively
14	Complexity classes, comparison of algorithms