

Syllabus: Algorithms and Graphs
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Objectives:

- Analysis of problems on graphs admitting an effective algorithmic solution.

Content:

- **Path in graphs:** elementary properties of graphs, machine representation, path in width and depth, applications to related components, bipartite graphs, diameter, strongly related components.
- **Oriented graphs:** graphs without circuits, topological sorting, level decomposition, closure and transitive reduction.
- **Shorter paths:** Dijkstra and Bellman-Ford algorithms.
- **Trees:** characterization theorem, recognition, enumeration, covering tree of minimum weight (Kruskal and Prim).
- **Maximum flows in a lattice:** duality theorem (maximum flow/minimum cut), Ford-Fulkerson method, Dinic algorithm, application to the connexity of a graph.
- **Coloring problems:** in the sense of edges (Vizing theorem) and in the sense of vertices, (Brooks theorem).

Elements of pedagogy:

- Approaches:
 - Inductive/deductive
- Methods:
 - Discovery/experimental/project
- Pedagogical techniques/pedagogical tools and implementation instruments:
 - Lecture, experimentation, presentation (of the learner), project, research
- Instruments for the implementation of the technique:
 - Audiovisual means, handout