Università degli Studi di L'Aquila - Dipartimento di Ingegneria e Scienze dell'Informazione e Matematica

Course catalogue

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Programme of Module "Network Flows"

- Code: DT0059
- Type of course unit:
- Level of course unit:
- Semester: 2

Number of ects credits: (Master Degree in Computer Science) 6 (workload 150 hours)

Teachers: Fabrizio Rossi (fabrizio.rossi@univaq.it)

1	**Course objectives**	Ability to recognize and formulate network flow problems Knowledge of basic and advanced network flow algorithms Ability to design resolution approaches to solve non standard network flow problems
2	**Course content and learning outcomes (dublin descriptors)**	Topics of the module include: • Network Flows Problem: introduction and definitions • Maximum Flows and the path packing problem. Flows and cuts: Max-Flow/Min-Cut theorem. Augmenting path algorithms: Ford and Fulkerson algorithm, Edmonds and Karp algorithm. Generic Preflow-Push algorithm. Flows with lower bounds. • Maximum Flows: additional topics and applications. Flows in Unit Capacity Networks. Flows in Bipartite Networks. Network Connectivity. • Minimum Cuts. Global Minimum Cuts. Node Identification Algorithm. Random Contraction. Applications. • Minimum-Cost Flow Problems. Definition and applications. Optimality Conditions. The Ford-Bellman algorithm for the shortest path problem. Primal algorithms: Augmenting Circuit Algorithm for the Min Cost Flow Problem. • Network Simplex Algorithms. Applications of Min Cost Flows. On successful completion of this module, the student should : • Know and formulate network flow problems • Model decision problems as network flow problems Use base and advanced algorithms to solve network flow problems • Ability to identify network flow models scope • Ability to explain network flows models and algorithms • Ability to learn state-of-art algorithms for network flow problems
3	**Course prerequisites**	Basic knowledge of: Discrete Mathematics, Linear Programming, Algorithms and Data Structures, Computational complexity
4	**Teaching methodsand language**	Lectures **Language**: English **Reference textbooks** • Cunningham, Pulleyblank, Schrijver , ***Combinatorial Optimization***. • Ahuja, Magnanti, Orlin, ***Network Flows***.
5	**Assessment methods**	Written text exam