

## UNIVERSITA' DEGLI STUDI MEDITERRANEA DI REGGIO CALABRIA

<b>Subject Code</b>	<b>16506</b>
<b>Subject Name</b>	<b>Graph theory</b>
<b>Professor</b>	<b>Vittoria Bonanzinga</b>
<b>Department:</b>	<b>DIIES</b>
<b>Degree course:</b>	<b>in Information Engineering</b>
<b>Class:</b>	<b>L8</b>
<b>Type of educational activity:</b>	
<b>Disciplinary Area:</b>	<b>Geometry</b>
<b>Scientific-Disciplinary Sector:</b>	<b>MAT/03</b>
<b>Compulsory preliminary exams:</b>	<b>NO</b>
<b>Course Year:</b>	<b>III</b>
<b>Semester:</b>	<b>II</b>
<b>ECTS:</b>	<b>6</b>
<b>Hours:</b>	<b>48</b>

### **Synthetic description:**

**Introduction to the basic concepts and results of graph theory: graphs, walks, paths, cycles, trees, connectivity, planarity, colorings, flows. Algorithms and applications.**

### **Acquisition of knowledge on:**

**The course also aims to provide the basic knowledge of graph theory: definitions, connectivity, planar graphs, colors, flows. It also aims to provide the tools and techniques of graph theory to the study of concrete problems for the construction of models and the search for solutions to decision problems.**

### **Evaluation method:**

**Written and oral tests**

**Student's independent work**

**For each credit 18 hours of individual study must be undertaken**

### **Detailed course program**

Origins: problem of the bridges of Königsberg. Definitions and basic concepts: definitions, cycle, multigraph, complete graph, bipartite graph, paths, circuits, connectivity components, the cutting point. Representation of graphs. Trees and planar graphs. Directed graphs. Matrices and vector spaces of graphs. Eulerian paths and circuits. Adjacency matrix. Incidence matrix. Matching. Graphs and colorings. Trees with roots.

Networks. Walk in the nets. Straight Eulerian. Hamiltonian circuit. Eulerian graph. Hamiltonian graph. Causal graphs. Dirac's theorem. Flows. Ramsey theory. Euler's theorem. Algorithms: the Warshall, Dijkstra, Floyd, Kruskal and Prim, Hungarian, Ford-Fulkerson, Davidson-Harel. Applications of graph theory to transport, power grids, computer networks for the distribution and storage of information.

### **Resources and main references**

1. R. Diestel, "Graph Theory" (pdf, 2.91MB), Springer-Verlag, Electronic Edition, 2005.
- 2 W. D. Wallis, A Beginner's Guide to Graph Theory, Second edition, Birkhäuser, 2007.
3. J. A. Bondy, U.S.R. Murty, Graph Theory, Graduate Texts in Mathematics, Springer 2010.
4. Claude Berge, graphes ET HYPERGRAPHES, Dunod Paris