Italian code: ECON-04/A　　　　　　　　　　　　　**Credits: 9**
Course: Networks and Decision Theory
Main language of instruction: Italian
Other language of instruction: English

Head instructor
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Objectives

The course provides students with the tools to analyze complex networks used to model problems in economic, financial, and managerial fields. The most common centrality and concentration indicators will be presented, followed by flow decision models, which constitute a class of mathematical network models applicable to many managerial problems. Finally, the CPM methodology will be introduced as a technique used for managing complex projects (Project Scheduling). In summary, the course "Networks and Decision Theory" has the following objectives:

1. It provides the indexes used to recognize nodes or groups of nodes that are more central within a network representing an organization composed of strongly interconnected units.

2. It describes the most common decision support models.

3. It provides network flow models and their properties, and analyze the relationships with centrality indicators.

4. It describes the CPM method as a technique for Project Scheduling.

Course structure

- Centrality measures
- Linear programming
- Network flow models
- Project scheduling

Competencies

A. **Knowledge and understanding:**
By the end of the course, the student will have knowledge of the basic topics characterizing network techniques. Additionally, the student will acquire the ability to apply the tools and methods studied in the course to model real situations that arise in economic, financial, and managerial contexts.

B. **Applying knowledge and understanding:**
The student will be able to use the knowledge of the proposed methods for the analysis of complex systems characterized by organizations composed of strongly interconnected entities. The E-tivities will be structured as case studies that the student will have to discuss and analyse during the exam.

C. **Learning skills:**
By the end of the course, the student will have knowledge of the basics of network techniques and the theory of decision support methods and models. This will enable them to complete their education in the economic field with the acquisition of quantitative techniques necessary to formulate and solve general managerial problems that may arise within a company.

Syllabus

Subject 1 – Centrality measures

Subject 2 – Linear Programming

Subject 3 – Network flow models

Subject 4 – Project Scheduling

Evaluation system and criteria

For Networks and Decision Theory the in-person examination is in Rome at Niccolò Cusano University and it will be organized in oral form. On-line examination is not allowed.
The exam covers the entire course program and it is aimed at verifying the skills acquired.

Bibliography and resources

1. Materials to consult

Written notes are available in Italian and part of them are also available in English. No video-lessons and slides are available.

2. Recommended bibliography

R.K. Ahuja, T. Magnanti, J.B. Orlin, Network Flows: Theory, Algorithms, and Applications, Prentice Hall, (1993). ISBN-13: 978-0136175490, ISBN-10: 013617549X.

1. G. Cornuéjols, J. Peña, R. Tütüncü: Optimization methods in finance (second edition), Cambridge University press, Cambridge CB2 8BS, United Kingdom (2018). ISBN 978-1-107-05674-9.