

Date:8/5/2024



Syllabus - Teaching Program for the Course
**Cooperative games and strategic interactions
in industry: A case-study course**

Marcello Sanguineti | University of Genova, Italy
Course 55-725-01

Course Type:	Class
Scope of credits:	2
Year of study:	2025
Semester:	B
Day & Time:	Friday 12:00-14:00
Reception Time:	—
Lecturer Email:	marcello.sanguineti@unige.it
Moodle Site:	—



Course description and learning goals

Course Abstract

Game Theory studies strategic interactions among two or more agents, which have to take decisions in order to optimize their objectives. It has various links to disciplines such as Economics, Engineering, Management, Computer Science, Robotics, Political and Social Sciences, Biology, Medicine, etc. These links provide incentives for interdisciplinary research and make the role of Game Theory invaluable in a variety of applications. After introducing the main concepts, the course focuses on a variety of case-studies, in such a way to let the students see cooperative games “in action”.

Learning objectives

The Course has a dual purpose, namely:

- to assimilate the main concepts and tools of cooperative games and team optimization;
- to “see” cooperative game theory at work in a selection of case-studies.

The vocation of this Course is essentially applicative. The use of cooperative games will be illustrated by means of applications to real-world problems. The technicalities will be kept to a minimum, in such a way to make the lectures accessible also to students with merely a basic mathematical background.

The students will learn the basic concepts of cooperative games and the basic tools to deal with interactive problems.

They will become able to model and study via tools from Game Theory a variety of problems arising in applications.

They will develop critical skills, open-mindedness, and the capability to exploit a novel point of view under which real-world problems can be considered and solved.

Active learning

Questionnaires during the lectures.

Discussion on case studies/toy problems.

For each topic, first a case study will be informally described, then the concepts and tools will be gradually introduced, finally the case study will be solved.

Formative assessment

Feedback given during the lectures, via questionnaires/group discussions on simple games in applications.

Class format

Class sessions involve a mix of methodological lectures and applications. Some sessions will be devoted to explain the main concepts and tools of cooperative games, then most sessions will present extensive case-studies, in which cooperative games are seen “in action”.

Agenda

- Examples, definitions, and basic properties of cooperative games

- Transferable-Utility (TU) games
- Solution concepts for cooperative games: stability and fairness
- Various case studies, selected among the following:
 - o measuring network centrality
 - o analysis of non-verbal interaction inside a group of people
 - o evaluating leadership in ensemble behavior
 - o analysis of human movement
 - o transportation network analysis
 - o assessment of public transportation transfers
 - o cooperation and profit allocation in distribution chains
 - o cooperation in supply industry



Final grade

Group assignments and/or questionnaires during the Course



Course requirements

Assignments in the form of exercises /reports

Attendance: 85% required



Prerequisites

Basic Operations Research

Basic statistics

Basic algebra and calculus

Bibliography

Lecture notes by the Lecturer

References to further reading for interested students will be provided during the Course.