

Doctoral Program in Economics



Academic year 2023/24

EVOLUTIONARY GAME THEORY

Period:

IV term: from May to June 2024

Course hours:

20

Teachers:

Leonardo Bargigli (10 h)

Leonardo Boncinelli (10 h) – course coordinator

Exam methods:

Writing of a critical essay on the relevant literature, including a computational application.

Prerequisites:

Elements of game theory and dynamic systems

MODULE 1: Theoretical Tools for Evolutionary Game Theory (Boncinelli)

Program

- Evolutionary stability, ecological dynamics, replicator dynamics
- Learning processes: reinforcement learning, imitation, myopic best response
- Long-run equilibria: errors and transitions between equilibria
- Applications to coordination and cooperation problems

Educational objectives

Learn the methods and techniques of the evolutionary approach economics and social sciences, and the ability to apply them to the understanding of social phenomena.

Bibliographical references

Suggested readings:

- Samuelson L., "Evolutionary Games and Equilibrium Selection", MIT Press, 1997
- Weibull L.W., "Evolutionary Game Theory", MIT Press, 1995
- Young, P.H., "Individual Strategy and Social Structure", Princeton University Press, 1998
- Begon, M., J.L. Harper, and C.R. Townsend, "Ecology: Individuals, Populations, and Communities", Blackwell Science Ltd., 1996

MODULE 2: Introduction to Scientific computation with application to Evolutionary Game Theory (Bargigli)

Program

- Introduction to scientific computing with Python
- Applications to basic evolutionary game theory models

Educational objectives

Learn the basics of scientific programming and be able to design and program a simple simulation code.

Bibliographical references

Suggested readings:

- [Python Programming for Economics and Finance — Python Programming for Economics and Finance](#)
- A. Isaac, Simulating Evolutionary Games: A Python Based Introduction, JASSS, 2008.
- https://python.quantecon.org/index_multi_agent_models.html.