

# Introduction to differential games

Prof.ssa Alessandra Buratto<sup>1</sup>

<sup>1</sup>Dipartimento di Matematica "Tullio Levi-Civita", Università di Padova  
Email: [alessandra.buratto@unipd.it](mailto:alessandra.buratto@unipd.it)

**Timetable:** 12 hrs. First lecture on February 21st, 2023, 11:00, (dates already fixed, see Calendar of Activities at <https://dottorato.math.unipd.it/calendar>), Torre Archimede, Room 2BC30.

**Course requirements:** Basic notions of Differential equations and Optimal control

**Examination and grading:** Homework assignments during classes + final presentation of a research paper selected from the literature on differential games.

**SSD:** SECS-S/06

**Aim:** Differential games are very much motivated by applications where different agents interact exhibiting an inter-temporal aspect. Applications of differential games have proven to be a suitable methodology to study the behaviour of players (decision-makers) and to predict the outcome of such situations in many areas including engineering, economics, military, management science, biology and political science. This course aims to provide the students with some basic concepts and results in the theory of differential games.

## Course contents:

- Recall of basic concepts of game theory, equilibrium (Nash ...)
- Dynamic games: formalization of a differential game
- Simultaneous and competitive differential games (Nash Equilibrium)
- Hierarchic differential games (Stackelberg equilibrium)
- Time consistency and perfectness

## References:

- Basar T., and Olsder G.J., Dynamic Noncooperative Game Theory Classics in Applied Mathematics.. SIAM 2 Ed., 1999.
- Bressan, A. Noncooperative differential games. Milan Journal of Mathematics 79.2 (2011) 357-427.
- Dockner, E.J. et al., Differential Games in Economics and Management Science, Cambridge University Press, 2000.
- Haurie, A., et al, Games and dynamic games. Vol.1 World Scientific Publishing Company, 2012.
- Jehle, G. A. and Reny P.J., Advanced Microeconomic Theory (Third). Essex: Pearson Education Limited, 2011.
- Long, Ngo Van, A Survey of Dynamic Games in Economics Surveys on Theories in Economics and Business Administration, Vol. 1, 2010.