

San Francisco State University
Mathematics Department
Spring 2017
Math 491: Game Theory

Instructor

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Office Hours: Wed 12:00-3:00pm (occasionally moved to Fri 12-3pm)

Class meetings: TuTh 2:10-3:25pm in TH 211

Jean-Pierre Langlois received his Ph.D. in Applied Mathematics from UC Berkeley. He has taught in Mathematics departments at UC Berkeley, UC Santa Cruz, and San Francisco State University, in the Government department at Georgetown University, and in the School of Social Sciences at the University of Versailles (France).

His work in game theory and applications to politics and economics has appeared in academic journals such as *American Journal of Political Science*, *World Politics*, *Journal of Mathematical Economics*, *International Studies Quarterly*, *British Journal of Political Science*, and *Journal of Conflict Resolution*. His *GamePlan* software has been reviewed in *The Economic Journal*.

Reading and Software

Game Theory with GamePlan (Langlois, 2015) Lecture notes.

Downloadable at: <http://userwww.sfsu.edu/~langlois/>

GamePlan 3.7 for Game Theory Software (Langlois, 2015).

Downloadable at: <http://userwww.sfsu.edu/~langlois/>

Requirements and grading

This course requires no specific mathematical background but students should have some mathematical maturity. Successful completion of Calculus II (Math 227) and some notions of probability theory and linear algebra are expected. Students should have good computer skills but no programming experience is required. Students must complete two modeling tests, homework assignments, and either a final exam or a term project during the course of the semester. Grading is based on two modeling tests (20% each), homework and participation (25%) and a final exam or a term project (35%). The term project can involve:

1. The modeling, testing, solving and critical discussion of a real-world problem that can be formulated in game theoretic terms; or
2. A term paper discussing the relations between Game Theory and your field of interest, or a topic relevant to the course material.

The term project must be defined and agreed on by the end of week 5.

Topics

Game Theory is a branch of applied mathematics that deals with problems of conflict and cooperation by postulating rational decision makers. It is used as a formal modeling tool in the Social Sciences and in Biology. It has been applied to issues such as nuclear deterrence, arms and trade rivalries, economic competition and collusion, legislative bargaining, and biological evolution. This course will introduce the students to the concepts and techniques of game theory and will develop their ability to understand, design, solve, and criticize game models. Class will be a mix of lectures, discussions, simulations, and laboratory (using the *GamePlan* software).

Each topic below corresponds to about one week of classes, for a total of twelve weeks. The remaining three weeks will be devoted to the presentation and discussion of modeling cases.

I. Basic Game Theory

- 1: Normal and extensive form games, strategy, best reply, and equilibrium.
- 2: Introduction to the *GamePlan* software.
- 3: The fundamental theorem (John Nash).

II. Advanced Concepts

- 4: Equilibrium path, beliefs, information, sequential rationality.
- 5: Games of incomplete information.
- 6: Repeated and dynamic games.

III. Basic Applications

- 7: Learning, signaling and screening.
- 8: Deterrence.
- 9: Social Dilemma.

IV. Advanced Topics

- 10: Repeated continuous games.
- 11: Strategic Bargaining.
- 12: Games of timing.

Instructor Policy

Students are expected and encouraged to participate and ask questions. Attendance is mandatory and instructor may take roll. All interactions should be courteous. Student complaints, if any, must be made privately and outside class. Cell phone use of any kind is *strictly prohibited* in class. Students must ensure that no device (cell phone, pager, etc.) can ring during class or they will be asked to leave immediately. Late students may be

turned away. The instructor may reseat students during tests. No recording of classes (taping, filming or picture-taking) is allowed without prior permission from the instructor. Laptop use is strictly limited to in-class exercises and tests with the *GamePlan* software.

University Policy

1. Disability access

Students with disabilities who need reasonable accommodations are encouraged to contact the instructor. The [Disability Programs and Resource Center (DPRC)] is available to facilitate the reasonable accommodations process. The [DPRC] is located in the [Student Service Building and can be reached by telephone (voice/TTY 415-338-2472) or by email (dprc@sfsu.edu).? (<http://www.sfsu.edu/~dprc>)]

2. Student disclosures of sexual violence.

SF State fosters a campus free of sexual violence including sexual harassment, domestic violence, dating violence, stalking, and/or any form of sex or gender discrimination. If you disclose a personal experience as an SF State student, the course instructor is required to notify the Dean of Students. To disclose any such violence confidentially, contact:

[**The SAFE Place** - (415) 338-2208; http://www.sfsu.edu/~safe_plc/]

[**Counseling and Psychological Services Center** - (415) 338-2208;
<http://psyservs.sfsu.edu/>]