

Games & Behavior

ECON 511H

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Department of Economics
University of North Carolina

Fall, 2015



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

Outline

1 Syllabus

- Goals
- Coverage
- Class
- Contact Information
- Grading Policy
- First Week To Do List
- Class Discussion
- Problem Sets
- Pre-requisites

2 On Math

3 FAQ



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Course Objectives

The course main goal is to provide tools to enable you to:

- 1 construct models of strategic behavior,
- 2 identify their (built-in) limitations and
- 3 think about how to apply them to real-life problems.



On Exactitude in Science

Jorge Luis Borges, *Collected Fictions*, translated by Andrew Hurley.

“In that Empire, the Art of Cartography attained such Perfection that the map of a single Province occupied the entirety of a City, and the map of the Empire, the entirety of a Province. In time, those Unconscionable Maps no longer satisfied, and the Cartographers Guilds struck a Map of the Empire whose size was that of the Empire, and which coincided point for point with it. The following Generations, who were not so fond of the Study of Cartography as their Forebears had been, saw that that vast Map was Useless, and not without some Pitilessness was it, that they delivered it up to the Inclemencies of Sun and Winters. In the Deserts of the West, still today, there are Tattered Ruins of that Map, inhabited by Animals and Beggars; in all the Land there is no other Relic of the Disciplines of Geography. Suarez Miranda, *Viajes de varones prudentes*, Libro IV, Cap. XLV, Lerida, 1658.”



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Mont Sainte Victoire

Photography vs Cézanne



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Reaching Our Goals

To achieve our goals, we rely on:

- 1 Class discussion.
- 2 Problem Solving.



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Recommended Textbook

Osborne, Martin J. (2004)

An Introduction to Game Theory, Oxford University Press.

This is an excellent textbook, although it is not required, it provides a very nice companion to our course and is a great reference source.



Tentative Covered

- 1 Decision Theory: Expected Utility and Information Partitions – August 25th
- 2 Games: Non-Cooperative and Cooperative Games – August 27th
- 3 Non-Cooperative Games: Solution Concepts: Nash Equilibrium – August 27th
- 4 Non-Cooperative Games: Solution Concepts: Iterative Deletion of Strictly Dominant Strategies – September 1st
- 5 Pareto Efficiency – September 3rd
- 6 Cooperative Games: Solution Concepts: The Core – September 3rd
- 7 Cooperative Games Applications: Matching and Trading – September 8th
- 8 Non-Cooperative Games: Applications of Nash Equilibrium – September 10th and September 15th
- 9 Midterm #1 – September 17th

Coverage continued

- 10 Constrained Optimization – September 22nd
- 11 Non-Cooperative Games: Solution Concepts: Mixed Strategy Nash Equilibrium – September 24th
- 12 Non-Cooperative Games: Solution Concepts: Mixed Strategy Nash Equilibrium Correlated Equilibria – September 29th
- 13 Non-Cooperative Games: Extensive Games: Solution Concept: Subgame Perfection – October 6th and 8th
- 14 Non-Cooperative Games: Extensive Games: Repeated Games – October 13th
- 15 Midterm # 2 – October 20th
- 16 Non-Cooperative Games: Extensive Games with Imperfect Information – October 22nd, 27th and 29th.
- 17 Super Modular Games – November 3rd and 5th.
- 18 Mechanism Design – November 10th and 12th.
- 19 Robust Mechanism Design – November 17th, 19th and December 1st.

Class Information

- We meet Tuesdays and Thursdays, from 12:30 to 1:45PM, at Gardner Hall, room 209.
- Whenever possible, please bring your laptop loaded with Mathematica to class.
- Sakai will be used to post grades, course announcements and links. However, e-mail and problem sets will not be managed thru Sakai.

Contact Info and Office Hours

- 1 Email: sergiop@unc.edu.
- 2 Do not sent e-mail thru Sakai.
- 3 PLEASE: subject line in any email must be E510
- 4 Office hours (OH) are by Google Calendar appointment only:
Monday 11AM-1PM
Wednesday 3-5PM
Friday 12AM-2PM
- 5 Do not email me to schedule appointment during OHs.
- 6 To schedule an OH meeting use [Google calendar](#):
 - 1 Login name: sergiop@email.unc.edu
 - 2 Password: given in class.
 - 3 Create an event with: your name, start and finish times.
 - 4 The calendar name is OH.
- 7 Email-me to schedule meetings **outside** OH.

Evaluation

- **September 17th** — 1st Midterm
- **October 20th** — 2nd Midterm
- **December 8th** at **noon** (time differs from class time) — Final Examination
- Midterm grades account for 30% of the final grade.
- Final examination grade is worth 35% of the final grade.
- Ten or more problem sets and writing assignments: 20%.
- Final Essay: 10%.
- Participation and initiative: 5%
- There are no make-ups.
- The weight of any missing midterm (with justification) is transferred towards the final exam.

Computing Grades

- Grades are not “curved”.
- Scale: $\text{Score} = \text{Exam Grade} + 100 - \text{Max Exam Grade}$.
- Course grades are computed accordingly to the table:

letter grade	min. score
A+	100
A	95
A-	90
B+	87
B	83
B-	80
C+	77
C	73
C-	70
D+	67
D	63
D-	60

To do list for the first week

- 1 If you are eligible for taking exams with Accessibility Resources, please schedule with them within the first or second week of classes and notify me.
- 2 If a) you have more than 3 final exams in more than 24 hours; b) ECON510 is one of these exams; and c) you wish to re-schedule one of your exams; then you **MUST** ask for an alternative date during *first two weeks of classes*. If you do not follow these procedures your request will not be accommodated.
- 3 Place an order for the software *Mathematica* throughout software.sites.unc.edu/software/mathematica/. The *student license is free*. However, you must place an order.

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Class Discussion

During this course, we shall employ additional material from TV, movies, or literature to discuss strategic related issues.

Sometimes, you may find the political or religious views; or the profanity contained in the additional material offensive or objectionable and you may feel uncomfortable.

I **do not** endorse any particular views ex but ...

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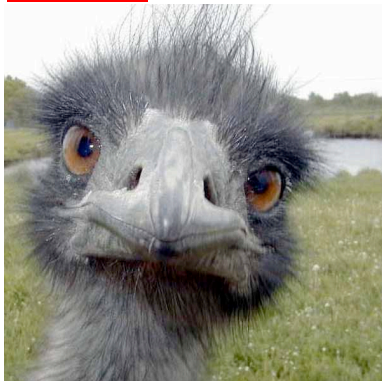
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Class Discussion

I believe that as part of your **university** education, it is important you



engage in **critical thinking**,
and also respect different opinions expressed by your classmates.

Real-life Applications

To discuss real-life applications, it is recommended that read at least one newspaper regularly, follow major current events and also pay attention to socio-economic or political events that have strategic content. Moreover, if you are heading to graduation and job-market I suggest you subscribe to one of these newspapers:

- 1 NY Times
- 2 Wall Street Journal

Another good source of news is the NPR podcast [Planet Money](#).

Problem Sets (PS)

- 1 PS are posted on http://www.unc.edu/~sergiop/E511H_PS.html.
- 2 PS are posted after every class and are due at the next class.
- 3 Past due date PS are not accepted.
- 4 Please be prepared to present and discuss the PS.
- 5 You are **strongly** encouraged to work in groups of at most four. In this case, please submit only one copy.
- 6 The grading criteria for the PS are:

grade	solutions	work	presentation
4.0	correct	explained	reasonable
3.5	comput. err.	explained	reasonable
3.0	concept. err.	explained	reasonable
2.0	–	omitted	reasonable
1.0	–	–	poor
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Some words about math.

We will cover bits of optimization, set theory and proof reasoning but I assume you have knowledge equivalent to Osborne's (suggested reading) mathematical appendix – please browse it – and please, do report any doubts or questions to me as soon as possible I can help you. Or check topics 1 to 2.3 in [Martin Osborne's tutorial](#).

- Language of Set Theory
- Basic Calculus (derivation and integration).
- Probability (expectation of random variables)
- Reading Proofs.
- Finding Maxima and Minima.

Mathematics is a tool (language)



Mathematics is a tool (language)

If $f : [a, b] \rightarrow \mathbb{R}$ satisfies $[\forall x \in [a, b]$ and $\forall \varepsilon > 0, \exists \delta > 0$; such that
 $|x - y| < \delta \Rightarrow |f(x) - f(y)| < \varepsilon]$
 $\Rightarrow \exists z \in [a, b]; \forall x \in [a, b] f(z) \geq f(x)$.

If a real-function defined on a closed interval on the real line is continuous then it attains a maximum on the interval.

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Questions & Answers

*This course is called Game Theory. I like games!
The course sounds/looks fun !!
Should I take this class?*

Sorry for curbing your enthusiasm...
But playing a game often is more fun than studying one... ☺

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I am about to graduate. I need an upper level requirement course. This course is the only one that fits my schedule. Should I take this class?

It depends on your degree of risk-aversion. The variance of grades sometimes is high. Many earn *A* grades (in particular in the Honors version of the course) but it is a challenging course, so lower grades are not unheard of.

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Is this course useful? for an Econ PhD

I want to go to grad. school in Economics. Game Theory is very important for Economics, should I take this course?

No. In grad school, you will have several opportunities to take Game Theory classes. If you want to increase your chances of being accepted by a top program, you should take more classes at the Mathematics Department.

Is this course useful?

Econ and other fields

Would you recommend this course to any Econ, CS or Poli Sci major or PPE minor?

Of course: if you want to learn more about incentives in strategic environments, this is a good course for you. If you plan to go to Law School, grad school in Public Policy, Political Science, etc ... or if you just want to learn for the sake of learning, this is a terrific course for you.

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Is this course useful? outside academia

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Chances are, you will not write down a model for some concrete real-life situation, solve for its equilibrium and make accurate predictions based on it. But that does not mean that models are useless. Game theory may help you avoid real-life pitfalls. Also check this Noah Smith's article for several interesting examples of applications of GT to real-life.

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