

# Games & Behavior

## ECON 511H

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Department of Economics  
University of North Carolina

Spring, 2015



THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL

# Outline

## 1 Syllabus

- Goals and Practice
- Coverage
- Contact Information
- Grading Policy
- First Week
- Class Discussion
- Problem Sets
- Workshops
- 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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# Reaching Our Goals

To achieve our goals, we rely on:

- 1 Class discussion.
- 2 Problem Solving.
- 3 Workshops.



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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.



# Coverage

- 1 Decision Theory: Payoffs
- 2 A Taxonomy of Games
- 3 Nash Equilibrium
- 4 Pareto Efficiency and Coalitional Games
- 5 Applications of Nash Equilibrium
- 6 Constrained Optimization
- 7 Mixed Strategies
- 8 Correlated Equilibria, Rationalizability and Evolutionary Equilibrium
- 9 Extensive Games
- 10 Extensive Games of Imperfect Information
- 11 Matching
- 12 Repeated Games
- 13 Mechanism Design



## Contact Information

- 1 Email: [sergiop@unc.edu](mailto:sergiop@unc.edu).
- 2 Do not sent e-mail thru Sakai.
- 3 Include E511 in beginning of the subject line in any email.
- 4 Office hours: Wednesdays, 10AM-4PM at GA 200B.
- 5 To schedule an office hours meeting use [Google calendar](#).
- 6 Please schedule any Wednesday meeting before Tuesday, 10PM.





## Evaluation

- **February 26th** — 1st Midterm
- **April 2nd** — 2nd Midterm
- **May 1st** 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



## subsectionFirst Week

## 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 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** first contact the professors of the other courses. If they are unable to accommodate your request, please forward your e-mail communication with them to me in the *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/](http://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 Game Theory 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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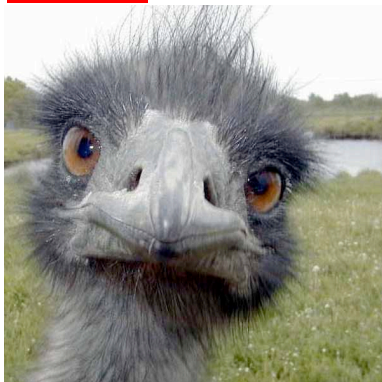
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## Class Discussion

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)

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- 2 PS are posted every Wed. and are due next Tue. in 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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## Workshops

Workshops are conducted **outside** class time.

Attendance is voluntary.

Students from Advanced Micro. E510, may also attend.

Workshop are collaborative sessions where we will :

- 1 Review mathematics we need.
- 2 Practice solving additional problems.
- 3 Learn how to use Mathematica (computer algebra software).
- 4 Learn how to use L<sup>A</sup>T<sub>E</sub>X(typesetting software).

**Tentatively** workshops will be help every other week at GA2009 from 5PM–6:15PM, starting Wednesday, August 27. Date and time may change due to room availability.

## 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.

## Mathematics is a tool (language)

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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 students receive *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

*I do not want to pursue (at the moment) any other future academic degree after my graduation, I want to find a job related to economics or business: industry, commerce or in the financial sector. But in real life people are not fully rational, will I be able to use any of the “equations” I learn in this class? What is the use of learning the equilibria of these artificial models?*

Probably you will not write down an economic model of a concrete real-life situation, solve for its equilibrium and make accurate predictions based on it. But that does not mean that models are useless. [Noah Smith's article](#) has several interesting examples.

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