API-303
Game Theory and Strategic Decisions
Course syllabus
Spring 2015

Faculty: Janina Matuszeski
Email: Janina_Matuszeski@hks.harvard.edu
Office: L208
Phone: 617-495-3561

Faculty Assistant: Sarah McLain
Email: Sarah_McLain@hks.harvard.edu
Office: 124 Mt. Auburn - Suite 200N-217A

Teaching Fellow: Alice Heath
Email: Alice_Heath@hks16.harvard.edu
Office Hours: Monday 12-2 pm
Office Location: L384A

Course Assistant: Jason Peuquet
Email: Jason_Peuquet@hks16.harvard.edu
Office Hours: Monday/Wednesday 10:30 – 11:30 am
Office Location: Taubman Carrel 5

Weekly Schedule

<table>
<thead>
<tr>
<th>Lecture (L130)</th>
<th>Section (LAND)</th>
<th>Office Hours</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Prof. Matuszeski*</td>
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<tr>
<td>Monday</td>
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<td>TF</td>
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<tr>
<td>Tuesday</td>
<td>11:40am – 1pm</td>
<td>See above</td>
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<tr>
<td>Thursday</td>
<td>11:40am – 1pm</td>
<td>3-4pm</td>
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<tr>
<td>Friday</td>
<td>11:40am – 1pm</td>
<td>1-3pm</td>
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* Or by appointment

Course Description: This course uses game theory to study incentives and strategic behavior in practical situations of inter-dependent decision making and negotiations. The course will develop basic theoretical concepts in tandem with applications from a variety of areas, including bargaining, competition, and strategic voting.

Grading: The class grade will be based on the following criteria:

- 20% - Problem Sets
- 20% - Midterm (in class)
- 30% - Group assignment: presentation and paper
- 30% - Final exam

REQUIRED ATTENDANCE DATES

This course includes mandatory attendance on Friday, April 3. Attendance is ALSO required for all students during the week of group presentations (Tuesday, April 28 and Thursday, April 30) and the final exam (9 am to noon on Thursday, May 7). DO NOT take this course if you cannot commit to attend on April 3, 28 and 30 from 11:40am to 1pm and May 7 from 9am to noon.
**Prerequisites:** There are no formal prerequisites. The course is designed to be accessible to all Kennedy School students, regardless of mathematical background. The lectures emphasize conceptual rather than technical material, however, additional technical material will be provided as optional readings.

**Books**

**Required textbook:**

**Recommended books:**
There will be some readings from these books and they are generally useful books to have. These may be purchased at the COOP. However, you are not required to purchase these books. Any readings from these will be available either through OCM or HKS library reserves.

**Other books:**
These books are more advanced or on specialty topics. Required readings from these will be rare and will be available either through OCM or HKS library reserves. All of these books are available via HKS reserves (except for possibly Morrow).
- Roy Gardner. *Games for Business and Economics*. Wiley. 1995. [This has lots of interesting real life topics. It focuses on how to set up the game, not just how to solve it. But, the organization of the book is not very clear. Written at an advanced level for some topics. 2 copies available at HKS reserves – readings available on course page.]
- John McMillan. *Games, Strategies, and Managers*. Oxford University Press. 1996. [Focuses on real-world applications. Written at an advanced level. 3 copies available at HKS reserves – readings available on course page.]
- Robert Axelrod, Robert M. *The Evolution of Cooperation*. BasicPerseus Books, Rev. Ed 2006. [There is one advanced reading from this book but it is NOT available on the course page. 1 copy available at HKS reserves.]
Requirements

Readings: Required readings are marked with an [R]. These are often short, topical articles from the popular press. Textbook readings are marked with [T]. ALL students are expected to do the Required [R] and Textbook [T] readings BEFORE class. Advanced readings are marked with an [A] and are strongly encouraged for all students, particularly those with a stronger economics or quantitative background. These readings contain important and innovative ideas that may or may not be covered in other parts of the course. Advanced readings are not required. Not every class has every kind of reading.

Group Project: The student group project will require you to apply game theoretical concepts to an area of your special interest, e.g. business, politics, or society. Students will be assigned to teams of 2-3 students, based on stated mutual interests. At the end of the semester, each team will make a short presentation of the issue during class and will submit a joint 5-page paper. The student group project will count for 30% of your grade. When submitting the paper, teams may choose to state that everyone contributed jointly to the assignment or to list the individual contributions of each team member. Individual, confidential surveys mid-way through the group work will allow students to share successes and challenges of the group project with the faculty member.

Problem Sets: There will be eight short problem sets, which will be graded. Problem sets count for 20% of the grade (2.5% each). Small groups of students—no more than four—are encouraged to work together on the problem sets. Problem solutions must be written independently by each of the students in the small group and must indicate the names of the students in the group. All problem sets are due at class time. Answers to the problem sets will be posted on the class web site shortly after they are turned in. Problem sets turned in after the class time on the due date will not receive any credit.

Problem Set and Assignment Due Dates:

<table>
<thead>
<tr>
<th>Date</th>
<th>Assignment(s) Due</th>
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<tbody>
<tr>
<td>Thursday, February 5</td>
<td>Problem Set 1</td>
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<td>Group project - Areas of interest form</td>
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<tr>
<td>Thursday, February 12</td>
<td>Problem Set 2</td>
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<td></td>
<td>Group project - Teams announced</td>
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<td>Tuesday, February 17</td>
<td>Problem Set 3</td>
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<td>Tuesday, February 24</td>
<td>Problem Set 4</td>
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<td>Tuesday, March 24</td>
<td>Group project – Problem area description</td>
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<td>Tuesday, March 10</td>
<td>Problem Set 5</td>
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<tr>
<td>Thursday, March 12</td>
<td>MIDTERM</td>
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<td>Tuesday, March 31</td>
<td>Problem Set 6</td>
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<td>Tuesday, April 7</td>
<td>Problem Set 7</td>
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<td>Tuesday, April 14</td>
<td>Group project – Draft game due</td>
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<td>Tuesday, April 21</td>
<td>Problem Set 8</td>
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<td>Tuesday, April 28 &amp; Thursday, April 30</td>
<td>Group project – Presentations in class</td>
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<td>Thursday, May 7</td>
<td>Final exam</td>
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<tr>
<td>Tuesday, May 12</td>
<td>Group project – Final 5 page paper</td>
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Course page software pilot:
This course has been selected to participate in a pilot of new course page software, Canvas. The
software will allow for accurate tracking of class participation and attendance, submission of
assignments, and several class discussions. A class discussion on the course page will be an
ongoing place for students to post what is and what is not working about the new system. Your
participation and feedback about Canvas as a tool will help with the HKS-wide roll-out of the
software in Fall 2015. And you will all already be experts!

Options for more advanced students
This course attracts talented students with a range of background in game theory and quantitative
subjects. Some students have no prior exposure to game theory and/or quantitative topics while others
have extensive prior experience. All students bring valuable real world and academic experience to the
course and all are welcome.

ADVANCED PROBLEM SETS
To aid in helping students tailor the class to be most useful to them, each student will decide in the first
week whether they will complete the Advanced problem on each of the first five problem sets. (Problem
Sets 6-8 will not have an Advanced question.) Students with a stronger economics or quantitative
background are encouraged to choose this option, but it is not required. If a student decides to commit
to do these five Advanced problems, he or she will be graded based on their performance including that
Advance problem, for the first five problem sets. Between the second and third problem set, students
may ask the faculty member to switch either into or out of doing the Advanced problems.

READINGS
Students looking for additional challenges in this course can also choose to do many of the advanced
readings. Questions or thoughts about these readings can be addressed in class or in office hours.

Note on source of teaching materials: The design of this course including readings and lecture slides is
attributable to Dr. Pinar Doğan who taught this course for many years. I am grateful.
Detailed Schedule and Readings (Tentative)

“DSR” is Dixit, Skeath and Reiley (2009)

All readings aside from the DSR textbook are available online via the course page (Exceptions: Feb 18 Axelrod reading is available at HKS reserves.)

Thursday, January 29: Introduction and Foundations of Game Theory

[T] DSR, Chapters 1 and 2.


[A] Kreps, Chapters 1 and 2 in *Game Theory and Economic Modelling*. [A readings for today give other perspectives and framing for game theory.]


Tuesday, February 3: Prisoners’ Dilemma and its Applications; Intro to Nash Equilibrium

[T] DSR, Chapter 4, Section 4.3.


Thursday, February 5: Pure Strategy Nash Equilibrium; Multiple Nash Equilibria and Equilibrium Selection

[T] DSR, Chapter 4, Sections 4.1, 4.2, 4.4, 4.6, 4.7 and 4.8

[R] "Amazon and the state of Illinois play a game of chicken over online tax collection." *mindyourdecisions.com*

[A] DSR, Chapter 5, Sections 5.1 and 5.2 [A discussion of continuous strategies, plus real world evidence on Nash Equilibria]

Thursday, February 12, Friday, February 13 and Tuesday, February 17: Min-Max and Mixed Strategies

[T] DSR, Chapter 7, Sections 7.1, 7.2, 7.3, 7.4, 7.6, 7.7 (except 7.2.C); Chapter 4, Section 4.5


[A] DSR, Chapter 7, Section 7.5 [A big picture discussion of some aspects of mixed strategies. Short.]

Tuesday, February 19: Repeated Games

[T] DSR, Chapter 11, Sections 11.1-11.3


Tuesday, February 24: Collection Action and Collective Inaction Games

[T] DSR, Chapter 12. [Heavier going than other assigned textbook readings. Take your time and take in what you can.]

[R] Schelling. "Thermostats, Lemons, and Other Families of Models." Chapter 3 in Micromotives and Macrobehavior. 83-133. [Very entertaining and insightful, although the language is dated This gives the general motivation for today’s lecture.]

[A] Schelling. “Hockey Helmets, Daylight Saving, and Other Binary Choices.” Chapter 7 in Micromotives and Macrobehavior. 213-243. [An in-depth look at binary choice games with more than two people. This is heavier on theory, but do-able.]
Thursday, February 26: Sequential-Move Games

[T] DSR, Chapter 3

Monday, March 2: Special Lecture on Elinor Ostrom’s Contributions to Collective (In)Action Problems


[R] Elster. "Social Norms and Economic Theory." *Journal of Economic Perspectives*. 1989. Vol. (3)4. 99-117. [This article is long but it is relatively straightforward, contains important content and is worth reading carefully.]


Tuesday, March 3: Simultaneous and Sequential-Moves Combined: Subgame Perfect Nash Equilibrium (SPNE)

[T] DSR, Chapter 6

Thursday, March 5: Subgame Perfection and Strategic Moves

[T] DSR, Chapter 10.


Tuesday, March 10: Application of SPNE to Bargaining

[T] DSR, Chapter 18, Sections 18.3-18.5.


Thursday, March 12: **Midterm** (on material up through and including Feb 24)
Tuesday, March 17, Thursday, March 19: **Spring Break (no classes)**
Feel free to do reading for Tuesday, March 31 in advance. There are a lot of required readings for this class so it’s too much to do the night before class. They are all relatively straightforward, rich in ideas, and of great relevance for public policy.

Tuesday, March 24: Introduction to Games with Incomplete Information

[T] DSR, Chapter 9, Section 9.2.


**Thursday, March 26: NO CLASS**

Tuesday, March 31: Moral Hazard and Adverse Selection

[T] DSR, Chapter 9, Sections 9 (intro pages), 9.4.A.

NOTE to students: There are a lot of required readings for this class, but they are all relatively straightforward, rich in ideas, and of great relevance for public policy. In spite of the number, you are expected to have completed all of these readings before class. Three are short (including the textbook reading) and the final R reading is longer.


[R] "Writing off tyrants’ debt is a principle that should be extended to even poorer nations." *The Guardian*. 21 April 2003.


**Thursday, April 2 and Friday, April 3: Signaling games**


[R] Dixit and Nalebuff. Chapter 8 in *The Art of Strategy*. [This is a great chapter with lots of great stories and examples and little math. I recommend reading it if you have time.]
Tuesday, April 7: Cheap Talk

[T] DSR, Section 9.3.


Thursday, April 9 and Tuesday, April 14: Auctions

[T] DSR. Chapter 17.


Thursday, April 16 and Tuesday, April 21: Strategy and Voting

[T] DSR, Chapter 16.


Thursday, April 23: Cooperative Game Theory and the Core

Readings TBD

Tuesday, April 28: Presentation of group projects I

Thursday, April 30: Presentation of group projects II

Thursday, April 30 - evening: Optional Lecture on Behavioral Game Theory

Thursday, May 7: Final Exam (9am-noon)

Tuesday, May 12: Group Assignment Final Paper due at 11:55pm