

ECONOMICS 379  
**GAME THEORY**

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<i>Lecture time and location:</i>	Mon, Wed 11:00 – 12:15, Diamond 342
<i>Office hours:</i>	Tue, Thu 2:30 – 4:00 pm or by appointment
<i>TA:</i>	Benjamin Ogden (bgogden@colby.edu)
<i>TA Office hours:</i>	Tue 8:00 – 10:00 pm, Diamond 343
<i>Course Web page:</i>	<a href="http://www.colby.edu/economics/faculty/jmlong/ec379">www.colby.edu/economics/faculty/jmlong/ec379</a>

This course introduces the basic concepts of game theory. Game theory is the study of strategic decision-making—that is, making decisions when individuals' actions affect each other. It is a powerful tool, applicable in a broad range of fields, from economics and business, to politics and law, and even biology. Firm competition, auctions, international conflict resolution, and animal mating behavior are all multi-agent decision problems; they are all games. In this course you will learn how to recognize games, how to formally model their key properties, and how to predict outcomes based on concepts of equilibrium. You will learn to think strategically, and to do so with care, precision, and rigor.

**Prerequisites:** Game theory builds on the principles of microeconomic theory and uses the tools of calculus and basic probability theory. This course will present game theoretic concepts using mathematical notation and formal reasoning. Microtheory, statistics, and one calculus course are required.

**Text:** Prajit K. Dutta, *Strategies and Games* (Cambridge: MIT Press, 2000).

**Course Requirements:** This class meets two times each week, on Monday and Wednesday mornings. You should be aware of the college's policies on attendance and religious holidays. They are spelled out in the current version of the Colby College Catalogue, which you can find on the college Web page at [www.colby.edu/academics\\_cs/catalogue/2010\\_2011/academic\\_program/religious\\_holiday.cfm](http://www.colby.edu/academics_cs/catalogue/2010_2011/academic_program/religious_holiday.cfm). This course will follow these policies.

(i) Problem sets will be assigned once every week or two throughout the semester, typically due in class on Thursdays. You may work together on the problem sets, but each student will submit solutions independently. All work that you submit must be your own. (ii) There will be two exams. The first will be on **Thursday, March 17 from 4-6 pm in Diamond 141**, and the second will be on **Thursday, May 5 from 4-6 pm in Diamond 141**. (iii) You will be required to complete an applied game theory project, modeling some real-life phenomenon as a game, solving for the equilibrium, and deriving results from the solution. You will write up your project to submit as a paper. Topics must be chosen by the end of March, and a short (one page) proposal will be due in class on **Wednesday, March 30**. The finished paper will be due by **4:00 pm on Friday, May 13**.

**Evaluation:** Your grade for the course will be based on four factors: the problem sets, the two in-class exams, and the applied project. The exams each are worth 30 percent of your grade, the project is worth 25 percent, and the problem sets are worth 15 percent. The only factor in your overall grade other than these scores will be class participation. I won't base an explicit part of the grading on participation, but it will be the principal factor in determining whether borderline grade cases go up or down.

**Academic Honesty:** Colby's policy on academic honesty can be found in the college catalogue, available online at [www.colby.edu/academics\\_cs/catalogue/2010\\_2011/academic\\_program/acad-honesty.cfm](http://www.colby.edu/academics_cs/catalogue/2010_2011/academic_program/acad-honesty.cfm). The college policy will be followed in this course. If you turn in work on the problem sets that is not your own, if you cheat on either of the exams, or if you plagiarize the work of others in your project, you will fail the course, and the incident will be reported to the chair of the economics department and to the dean of students. In case you are uncertain, helpful guidelines on what in fact constitutes academic dishonesty are available on the Economics department's Web page, at [www.colby.edu/economics/resources/345.html](http://www.colby.edu/economics/resources/345.html).

## Class Schedule

<u>Date</u>	<u>Topic</u>	<u>Chapters</u>
Week 1: February 2	Introduction to Theory and Applications	1,2
Week 2: February 7	Strategic Form Games and Dominant Strategies	3
Week 2: February 9	Dominance Solvability	4
Week 3: February 14	Nash Equilibrium	5
Week 3: September 16	Application: Cournot Duopoly	6
Week 4: February 21	Application: The Commons Problem	7
Week 4: February 23	Mixed Strategies	8
Week 5: February 28	Extensive Form Games and Backward Induction I	11
Week 5: March 2	Extensive Form Games and Backward Induction II	11
Week 6: March 7	Subgame Perfect Equilibrium I	13
Week 6: March 9	Subgame Perfect Equilibrium II	13
Week 7: March 14	Finitely Repeated Games	14
<i>Week 7: March 16</i>	<i>No Class</i>	
<i>Week 7: March 17</i>	<i>EXAM 1: 4 – 6 pm</i>	
<i>Week 8: March 21, 23</i>	<i>No Class: Spring Break</i>	
Week 9: March 28	Experiment – Repeated Price Competition; Infinitely Repeated Games I <b><i>Meet in Diamond Computer Lab</i></b>	15
Week 9: March 30	Infinitely Repeated Games II. <i>Project proposals due.</i>	15
Week 10: April 4	Infinitely Repeated Games III	15
Week 10: April 6	In-class Prisoners' Dilemma Tournament	
Week 11: April 11	Tournament Discussion, Games of Incomplete Information I	20
Week 11: April 13	Games of Incomplete Information II	20
Week 12: April 18	Games of Incomplete Information III	20
Week 12: April 20	Signaling Games and the Lemons Problem I	24
Week 13: April 25	Signaling Games and the Lemons Problem II	24
Week 13: April 27	Mechanism Design, the Revelation Principle, Sales to an Unknown Buyer	22
Week 14: May 2	Auctions	23
Week 14: May 4	<i>No Class</i>	
Week 14: May 5	<i>EXAM 2: 4 – 6 pm</i>	
<i>Week 15: May 13</i>	<i>Projects Due, 4:00 pm</i>	