ISyE 6230
Economic Decision Analysis II
Spring Semester 2007

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Class page: www.isye.gatech.edu/~jswann/teaching/6230s07
WebCT: http://webct.gatech.edu
Class meeting time/place: Tues/Thurs 3:15 – 4:35 pm, IC 105

PRE-REQUISITES

ISYE 6669 (Deterministic Optimization): Relevant concepts from this class include objectives and constraints (formulating and understanding mathematical symbols), sensitivity analysis, lagrangian relaxation, and KKT conditions. Students are responsible for ensuring that they have the appropriate background, including reviewing the material if necessary.

TEXTS

Suggested Reading for all students:

- *Game Theory for Applied Economists* by Robert Gibbons, Princeton University Press (1992).

Reference books:

- *Game Theory* by Drew Fudenberg and Jean Tirole, MIT Press (1991). [especially for PhD students]
- *An Introduction to the Economics of Information: Incentives and Contracts* by I. Macho-Stadler and J. D. Perez-Castillo, Oxford University Press (2001).
- *Microeconomic Analysis* by Hal Varian, W. W. Norton and Company (1992).

Additional Reading (most available online):

- Game Theory in Business Applications by Feryal Erhun and Pinar Keskinocak.
- Game Theory in Supply Chain Analysis by Gerard Cachon and Serguei Netessine.
- Supply Chain Coordination with Contracts by Gerard Cachon.
- www.gametheory.net

Many of the optional texts will be on reserve in the GT library for this class. In addition, if you miss a class or need to review material again, videos of the class will also be available in the library or through WebCT.

COURSE DESCRIPTION AND OBJECTIVES

In this course we will study the interactions between multiple players (decision makers), such as suppliers, manufacturers, retailers, consumers, etc., and the resulting dynamics in a market

environment. In any business, interactions with customers, suppliers, other business partners, and competitors, as well as interactions across people and different organizations within the firm, play an integral role in any decision and its consequences. Advances in information technology (IT) and e-commerce further enrich and broaden these interactions, by increasing the degree of connectivity between different parties involved in commerce. Thanks to globalization, now the entire world is the playground for many firms, increasing the complexity of these interactions.

Given that each firm is part of a complex web of interactions, any business decision or action taken by a firm impacts multiple entities that interact with or within that firm, and vice versa. Ignoring these interactions could lead to unexpected and potentially very undesirable outcomes. Our focus in this course will be on the strategic behavior of the players in the market and the impact of the market (or contract) structure on the participants' actions and the overall market dynamics. In making a decision, each player acts on self-interest, e.g., tries to maximize its own profit, and therefore has to consider the potential responses/reactions of other players. Typical decisions of manufacturers and suppliers include quantity to produce and sell, and pricing. Typical decisions of consumers include what to purchase, from which vendor, and how much.

The strategic interaction of a firm with its competitors, customers and suppliers can be modeled as a game, and hence, our main tool of analysis in this course will be Game Theory. To identify its own strategy, each firm needs to understand how other firms or customers form their strategies and expectations. Given an understanding of other players' behavior, each player can then form its one's own best response strategy.

Course goals will be accomplished through lectures, homework, and readings. Lectures will generally emphasize the theoretical aspects of the field, and homework will focus on problem solving skills. Guest lectures, videos, and classroom games may complement the class material and help you to connect theory with practice.

COURSE TOPICS

The course deals with strategic decision making in reactive environments by groups and organizations when there are multiple interested parties (with different objectives and options). Topics to be covered include:

- Introduction to game theory (game representation in normal and extensive form, Nash equilibrium, pure vs. mixed strategy equilibria, etc.)
- Equilibrium models (Cournot, Stackelberg, Bertrand)
- Supply chain coordination (revenue sharing, rebates, sequential procurement, etc.)
- Bayesian games with incomplete information
- Principal-agent models including topics such as revelation principle, moral hazard, adverse selection
- Price discrimination
- Guest lecturers of game theory applications in various disciplines

GRADING

Students are responsible for all announcements made in class and for all changes in the schedule that are posted on the class website.

Homework: All homework assignments will be required. Only a (randomly selected) subset of problems will be graded in some of the homework, and your grade will be based on your work in that subset. Depending on their length and difficulty, the total number of points in each homework might vary. Some homework assignments may be based on case studies. Students can discuss the assignments, but *every student must turn in his/her own written solutions in his/her own words*. Homework is meant to be a learning tool. If you are having difficulty, find help right away – don't wait until you fall even further behind! Good sources of help are fellow students, teaching assistants, and me.

Homework will be posted on the course website with associated due dates. Late assignments carry no credit. The lowest homework grade will be dropped at the end of the semester.

Midterm Exams: The midterm exams will be held on or about February 15 and March 29. Exact dates will be announced closer to each exam. Each midterm exam will be cumulative, i.e., will include all the topics covered in class since the beginning of the semester until the time of the exam. In-class exams will be closed book, closed notes, and must be done individually. If any equations sheets are allowed for exams, you will be informed in advance.

No makeup exams will be given under any circumstances. If you have to miss an exam (for whatever reason), you will receive a grade of "0" for that exam unless you have a doctor's documentation of illness or official travel documentation for Georgia Tech business.

Final Exam: The final exam will be on Monday April 30, 11:30 am – 2:20 pm.

Grading: Homework assignments will account for 25% of your total grade. Depending on their length and difficulty, homework assignments might carry different weights. The exams will contribute 75% total to your final grade and are equally weighted.

Participation: You are expected to participate in class lectures by asking and answering questions, playing class games, etc. Lack of participation can hurt your grade.

Honor Code: The Georgia Tech Honor Code will be strictly enforced in this class. It is each student's responsibility to understand and abide by the Honor Code as it applies to each class activity. In regard to exams, all work is to be done on an individual basis. You may not discuss or exchange information on exam questions or answers with others either in or outside of this class. Asking anyone other than the instructor to interpret an exam question, its response, or the material covered in the question is a violation of the Honor Code. Changing your answer on graded exams is also disallowed. You may form study groups in which to prepare prior to exams or classroom discussion. Failure to adhere to any of these requirements constitutes a violation of the Honor Code; other situations are also at the discretion of the instructor.

To protect the honest majority, any cheating on any exam, big or small, will be penalized by an "F" in the course and the student will be referred to the Dean of Student Affairs for disciplinary action. Cheating on homework will also receive disciplinary action. If there is any question as to whether an activity is or is not permissible (in this class) under the Honor Code, consult the instructor prior to undertaking the activity. The Georgia Tech Honor Code is available at http://www.deanofstudents.gatech.edu/Honor/.