

## Fall 2011 IE 675: Game Theory

Time: 3:00 PM - 4:20 PM Monday, Wednesday

Place: Room 260 Capen, North Campus

Web: Please use [UBlearns](#) to to assess all course information

### INSTRUCTOR

Jun Zhuang, 403 Bell Hall

E-mail: [jzhuang@buffalo.edu](mailto:jzhuang@buffalo.edu) (Please put "IE 675" on the subject of all your emails)

Phone: 716.645.4707 (Office)

Office hours: 10:30-11:30AM Tuesday, 2:00-3:00PM Tuesday

### REFERENCES

There is no required textbook but the followings are recommended. Course slides will be distributed through UBlearns. Several journal articles will be assigned for reading and discussion, throughout the semester.

- ★ *Games of strategy*, By Avinash K. Dixit, Susan Skeath, and Susan Skeath, The third edition, 2009, W. W. Norton.
- ★ *Microeconomic theory*, By Jerry R. Green, Andreu Mas-Colell, and Michael D. Whinston, 1995, Oxford University Press.
- ★ *Game theory*, By Drew Fudenberg and Jean Tirole, 1991, MIT Press.

### CATALOG DESCRIPTION

This course targets the graduate students who may have little or no game theory background, but have serious interests in conducting a project/research/thesis related to game theory. This course will start with the fundamentals of individual and group decision making analysis, then introduce topics including mechanism design, the signaling game, the screening game, the repeated game, the differential game, the behavioral game, and the evolutionary game. Finally, this course will introduce some state-of-the-art game-theoretic research on supply chain management, transportation, health care, and homeland security. Each student will work on a separate project throughout the semester, including presentations and written reports.

### PREREQUISITES

Graduate student status; and serious interests in conducting a project/research/thesis related to game theory.

### COURSE GRADING

Homework = 30%; Project written proposal = 10%; Project oral proposal presentation = 10%; Project oral final presentation = 15%; Project written final report = 35%.

To qualify for a particular letter grade, the minimum course average shown after that grade will be needed: A (90); A- (86); B+ (82); B (78); B- (74); C+ (70); C (66); C- (62); D+ (58); D (54); and F

(less than 54). I reserve the right to lower these cutoffs (i.e., give higher grades than indicated) under some circumstances. Therefore, class average will not be lower than a B+. However, I will not raise the cutoffs.

## HOMEWORK

There will be about 4-5 homework in this semester. Homework must be turned in by the end of the class period in which it is due. Provide your full name and student ID number for each of the homework that you submit. Late homework will not be accepted, except in extenuating circumstances (e.g., family emergency, illness, etc.), with official documents.

You are encouraged to join with other students in discussing the course, including homework. This is especially useful if you have first tried to solve the problem on your own, and focus on understanding the reasons for any differences between your answer and someone else's approach, rather than just copying the answer that someone else got. Note, however, that when you write up the work that you hand in, you should do so on your own. You are strongly recommended to turn in a computer-generated (e.g., L<sup>A</sup>T<sub>E</sub>X, MS Word) homework if possible.

## PROJECT

Each student works on a separate project. Project is an essential part for this class, which consists of four parts: written proposal (3 pages, single spacing with 12pt fonts), oral proposal presentation, oral final-term presentation, and written final report (15-20 pages, single spacing with 12pt fonts).

In the beginning of the semester, students are strongly encouraged to discuss with their own academic/research advisors to find a suitable project/research/thesis topic related to game theory. Each student is required to discuss with and get a permission from the instructor, regarding the detailed project topics and plans, in office hours or by other appointments by September 21 2011.

Projects could be based on the research which has been initiated before, in which cases the students must clearly document which parts have already been done and which parts are additional progress for this course project, in all presentations and reports.

The written proposal is due by October 3 2011; and the written final report is due by December 9 2011. Both presentations will be scheduled in class and evaluated by both students and the instructor. Project gradings will be based on the (oral and written) presentation skills, the quality of the (new) research, and the eventual probability of getting published in a scholarly journal.

## ATTENDANCE

Although positively correlated with your homework and project grades, attendance at the lectures will not be directly included in your final grade. However, attendance is fundamental to the course, so if you don't come to class, you are giving yourself a disadvantage. Absenteeism can also be a sign of illness or other serious problems; don't hesitate to email or call to discuss the reasons for any absences. If you need help, please let me know, and I will try to connect you with the appropriate campus resources.

## OFFICE HOURS

To be fair to all of the students and to the colleagues that we work with, please cooperate with us in respecting the office hours of the professor. However, individual appointments can be made, if the posted office hours are insufficient or inconvenient. You may email the instructor at any time to discuss your questions by email, or to set up an appointment. I will respond as soon as possible, but you should be aware that I do not always check my email on the evenings and weekends, or when I am traveling. If you need to reach me on an urgent

basis, you can also try leaving a message on my voice mail with information on when and how I can reach you by phone.

### UNIVERSITY POLICY ON ACADEMIC INTEGRITY

All work must be your own. Plagiarism is never allowed. If any student is found in violation of maintaining academic integrity, sanctions will be imposed. This can be as severe as receiving an 'F' in the course. Especially flagrant violations will be considered under formal review proceedings, which can call for harsher sanctions including expulsion from the University. If you ever have any questions or concerns regarding the policy, particularly as it related to this course, see the instructor.

### COURSE OUTLINE

There are twenty-seven 80-min lectures in the fifteen instruction weeks (August 31–December 9), excluding Two UB holidays: 09/05 (Labor Day); and 11/23 (Fall Recess). The following schedule for those 27 lectures are tentative and subject to change:

- ★ Introduction (1 lecture)
- ★ Individual Decision Making (4 lectures)
  - ✓ Preferences and utilities
  - ✓ Decision making under uncertainty
  - ✓ Optimization with and without constraints
  - ✓ Markov decision process/dynamic programming
- ★ Group Decision Making (8 lectures)
  - ✓ Normal-form and extensive-form games
  - ✓ Best responses and Nash equilibrium
  - ✓ Simultaneous and sequential games
  - ✓ Complete and incomplete information games
  - ✓ Cooperative and non-cooperative games
  - ✓ Zero-sum and non-zero-sum games
  - ✓ Discrete and continuous games
- ★ Student Project Proposal Presentation (2 lecture)
- ★ Advanced Topics in Game Theory (4 lectures)
  - ✓ Games and Operations Research
  - ✓ Mechanism design, signaling games, and screening games
  - ✓ Repeated games and reputation
  - ✓ Differential games
  - ✓ Behavioral game theory
  - ✓ Evolutionary game theory
- ★ Research related to Game Theory (3 lectures)
  - ✓ Supply chain games
  - ✓ Transportation games
  - ✓ Health care games
  - ✓ Homeland security and emergency response games
  - ✓ International relations: conflicts and collaboration games
- ★ Student Project Final Presentation (3 lectures)