

Game Theory Applied to Business Decisions Syllabus

(ECO 6409; Fall 2022; Romano)

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Reading: Course Notes: These are available at the Canvas website under Files > Lectures.

Dixit, A. K. & Nalebuff, B. J., *The Art of Strategy: A Game Theorist's Guide to Success in Business and in Life*, W. W. Norton & Company, 2008, paperback 2010.

Prerequisites: Managerial Economics (ECP 5702) or equivalent. It bears emphasis that this is a course in applied math and we will use basic differential calculus, calculate mathematical expectations, and build and analyze mathematical models. (This is discussed further below.)

Canvas Website: This has the Course Notes, the syllabus, practice questions, and I will post things like graded assignments and (eventually) answers to them. I will use the announcement function to post any announcements. Also, access to the Zoom online office hours is at the website.

Class Times and Room: Class meets T & TH, periods 3-4, August 23 – Oct. 6, with the final exam on Oct. 11 (periods 3-4). Classes and the final exam are in Stuzin 104.

About This Course and Course Objectives: We will study game theory applied to business, economic, and other decisions. My strategy to teach you game theory is to organize the development around the variety of types of games, examining numerous examples and mixing in the basic theoretical results. Below is a topics outline with time line that is more specific. My objectives are: (i) for you to learn game theory basics; (ii) for you to appreciate the variety of environments to which game theory can be applied to frame and analyze the environment, with most, but not exclusive, emphasis on business and economics applications; (iii) for you to be able to solve games; and (iv) for you to develop your skill at viewing problems involving intertwined decision making through the lens of the game theorist.

Topical Outline/Reading/Timing¹:

Note on Reading: The Cx's below refer to Chapter x in the Dixit and Nalebuff (D&N) text. This textbook reading is to enhance your understanding. We will do some of the examples in the reading, but I do not at all track this book. The book is widely read by business people and is very good at providing intuition about game theory. Your main resource is the Course Notes.

Topic 1: Game Theory Introduction ~ 3 hours; August 23, August 25.
Reading: Course Notes Section 1; C1 of D&N.

Topic 2: Simultaneous Move Games ~ 7 hours; August 25, August 30; Sept. 6, Sept. 8.
Reading: Course Notes Section 2; C3 & C4 D&N (Note: Best to not skip C2, which is main reading for Topic 4). C11 D&N optional.

Topic 3: Simultaneous Move Games
with Multiple Equilibria ~ 2½ hours; Sept. 13; Sept. 15.
Reading: Course Notes Section 3.

Topic 4: Sequential Move Games ~ 7 hours; Sept. 15, Sept. 20, Sept. 22; Sept. 27.
Reading: Course Notes Section 4; C2 & C6 D&N.

Topic 5: Evidence on Game Playing ~ 1½ hours; Sept. 29.
Reading: Course Notes Section 5.

Topic 6: Randomization ~ 3 hours; Sept. 29, Oct. 4.
Reading: Course Notes Section 6; C5 D&N.

Topic 7: Repeated and Other Dynamic Games ~ 4 hours; Oct. 4, Oct. 6.
Reading: Course Notes Section 7; C9 D&N optional.

Methodology and Math: Game theory is a branch of applied mathematics so this course is essentially one in applied mathematics. We characterize strategic problems (games) mathematically and solve optimization problems of the involved decision makers (players) to find equilibrium. Games vary a lot in how difficult they are. Some are simple, even trivial. Some are very difficult, beyond the scope of this course. We examine easy and not-so-easy games, some requiring the use of basic differential calculus and calculation of expectations (for environments involving randomness). The analysis is conducted in the context of theoretical models, and we have to think somewhat creatively sometimes to figure things out. (It is not a matter of applying formulas.) We do not develop many proofs, but a few. *If you are intimidated by math and/or uninterested in developing theory, then you do not want to take this course.* I am not trying to get students to drop the course, but want to make sure that you are interested. To get a sense as to level of analysis, the thing to do is to look through the Course Notes, including later parts. Finally on all this, let me say: It is the nature of the beast. Game theory is game theory.

¹ I emphasize that the times for the topics are approximate. The coverage is fairly ambitious. I expect that I will skip some subtopics in the Course Notes, of course being clear about what I will not test you on.

Learning Game Theory. It is important to attend all classes. Review your Course Notes and make sure you understand the material and problems we cover. Associated with each section of the course (i.e., each section of the Course Notes), there are practice questions/problems. These are located at the Canvas website under Files > Practice Questions. Make sure you do these. We can discuss some of the practice problems, *but it is important for you to have any questions about these ready.*

Grading and Teams: Grading is based on two take home problem sets (each worth 30% of your grade) and an in-class final exam (worth the remaining 40%). *You can work with one or two other people on the problem sets, or by yourself. We will set up teams before the first assignment on Sept. 8.* Students that work together will get the same score. Switching teammates or working by yourself on the second assignment is allowed, but it is essential to inform your previous partners early, at least a week before the second assignment is handed out. I will give out the first problem set on Sept. 8, with a hard copy due at the beginning of class on Sept. 15. I will give out the second problem set on Sept. 29, and it will be due at the beginning of class on Oct. 6. The final exam will be given during the regular class time in our regular room on October 11. You can have two pages of notes for this, each one sided. The take home questions and the exam questions will be drawn from what we cover in class and the practice questions, though not necessarily identical.

Classroom Expectations:

- **Attendance is required with the exceptions summarized in the UF Attendance Policy. These exceptions include illness. Of course, do not attend if ill!** (Please see [UF Attendance Policy](#) for exceptions to attendance.) Students are expected to be punctual in class attendance and remain in the classroom for the entire class session, unless an urgent need arises or prior arrangements have been made with the instructor. (I also recognize that your job search might lead you to not attend, but please clear this with me in advance.)
- Students are expected to arrive for class prepared to meet classroom obligations and to devote full attention and commitment to the work of that class, as well as to actively participate in the class.
- **Laptops and other electronic devices (phones!) should not be turned on. If you take notes on your laptop, clear this with me.**
- I hold myself to the same standards of behavior that I expect of students!

Professionalism and Honor Code: Students are bound to not cheat or plagiarize, and are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: ‘On my honor, I have neither given nor received unauthorized aid in doing this assignment.’”

You should familiarize yourself with the [UF Student Honor Code](#). Cheating and plagiarism are not the only violations of this policy. Importantly, ignorance of a policy is not a valid reason for violating it.

Students Requiring Accommodations: Students with disabilities requesting accommodations should first register with the Disabilities Resource Center (392-8565; <https://disability.ufl.edu/>), providing appropriate documentation. Once registered, students will receive an accommodation letter that can be presented to the instructor when requesting accommodations. Please register at the beginning of the course if seeking accommodations.

Course Evaluation: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via ufl.bluera.com/ufl/.

Recording Lectures: (The language that follows is from university guidelines.) Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Health Counseling and Emergencies:

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or

<http://www.police.ufl.edu/>.