

Game Theory Applied to Business Decisions Syllabus

(ECO 6409; Fall 2020; Romano)

Instructor: Richard Romano, Professor of Economics
Office: My email is my virtual office.
Office Hours: Email your questions. Our regular synchronous sessions also include office hours.
Phone: (386)409-8598
Email: romanor@ufl.edu

TA: Don Tawanpitak
Email: d.tawanpitak@ufl.edu

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 will serve as our key means of communication, including where you access recorded lectures. I will be sending you regular announcements using this function at the website.

About This Course: 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 approximate time line that is more specific. My goals are to: (i) teach your game theory basics; (ii) demonstrate the variety of environments to which game theory can be applied to think about and analyze the environment, with most emphasis on business and economics applications; and (iii) to develop you skill at viewing problems involving intertwined decision making through the lens of the game theorist.

The Plan and Grading: This course is 100% online. The topics outline with reading is below. Each week I will provide four or so recorded lectures that you should watch, each lecture around an hour. These will closely track the extensive Course Notes I have provided. Of course, you can pause and re-watch parts, etc. *I will regularly update you at the Canvas website regarding what you need to watch and by when.* (To access recorded lectures: At Canvas website, click on Video Lectures > Click "Open in New Tab" button.) There are practice questions for each section, collected in a separate file (at Files > Supplemental Materials). It is crucial that you do them to learn the material. Then we will have two synchronous sessions each week beginning at your regular class time. These will be an hour if we can use the time. *You can and should ask questions during these sessions of course.* We can discuss some of the practice problems. *It is important for you to have your questions ready for these.* Regarding grading, I will post problems for you to do and provide to me to be graded (with immediate announcements when they are posted). The *expected* dates are Sept. 11, May 27, June 9, and June 17. In each case, I will give you three days to provide me your written answers. Each will be worth 25%. *These are open book, but you are*

pledged to work on them yourself. I will keep you informed of any changes in dates, which would only be by a day or so depending on how things go. (Note: In providing me answers, you will be drawing some matrices and such and providing some mathematical analysis. I am presuming that you all can scan stuff and put it together to provide to me. This is so that you can hand draw matrices and whatever else. We will discuss if there are any issues with this.)

Topical Outline/Reading/Approximate Timing:

Note on Reading: The Cx's below refer to Chapter x in the Dixit and Nalebuff 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 ~ 2 lectures
Reading: Course Notes Section 1; C1 of D&N

Topic 2: Simultaneous Move Games ~ 5 lectures
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 ~ 2 1/2 lectures

Topic 4: Sequential Move Games ~ 5 lectures
Reading: Course Notes Section 4; C2 & C6 D&N

Topic 5: Evidence on Game Playing ~ 1 lecture
Section 5 of Course Notes

Topic 6: Randomization ~ 3 lectures
Section 6 of Course Notes; C5 D&N

Topic 7: Repeated and Other Dynamic Games ~ 4 lectures
Section 7 of Course Notes; 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 using (very 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, 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.

The Contract: *What follows is very important.* I have some, but limited, experience teaching in this environment. I know game theory, but have limited experience using the teaching technologies for online teaching. I have put together extensive Course Notes for you. I will do the best job that I can with our asynchronous and synchronous communications and will respond to questions that I get by email in a timely manner (though this does not mean immediately). Your end of the contract is to pledge to keep up and work on your own on assignments. Remember that I have provided practice questions for each section we cover. It is absolutely fine to work together on practice problems, but to learn you need to not free ride.

Rules on Recordings: *These are university requirements and language.* Our class sessions may be audio-visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate verbally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Students with Disabilities: I am happy to comply fully with the official university practices on teaching students with documented disabilities. Please adhere to the university rules.