Game Theory Applied to Business Decisions Syllabus

(ECO 6409; Fall 2021; Romano)

Instructor: Richard Romano, Professor of Economics
Office: Matherly Hall 203
Office Hours: Online 1-3pm (access at Canvas > Zoom where you will also find password) and by appointment
Phone: (352)392-4812
Email: romanor@ufl.edu

TA: Don Tawanpitak, advanced economics Ph.D. student
Office: Matherly Hall 301a
Office Hours: M,F 10-11:30am
Phone: (352)284-9547 (message first if want to call)
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 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 (which has the passcode to these office-hour meetings).

Covid and Possibility of Online Lectures: First, please be aware that I am in a high risk category. I hope that you will wear a mask in class and to help protect yourself, your peers, and me. Also, of course, please get a vaccine if you have not. Second, I think there is some chance that we would move to online, if so, probably temporarily. It is then particularly important that you pay attention to announcements, where I would inform you of this should it occur. Thanks.

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 your skill at viewing problems involving intertwined decision making through the lens of the game theorist.

Topical Outline/Reading/Approximate Timing[1]:

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 ~ 3 hours
Reading: Course Notes Section 1; C1 of D&N

Topic 2: Simultaneous Move Games ~ 7 hours
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 ~ 3 hours

Topic 4: Sequential Move Games ~ 7 hours
Reading: Course Notes Section 4; C2 & C6 D&N

Topic 5: Evidence on Game Playing ~ 2 hours
Section 5 of Course Notes

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

Topic 7: Repeated and Other Dynamic Games ~ 3 hours
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 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 estimates. 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 crucial to attend all classes; attendance is required. 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: 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 other person on the problem sets, or by yourself.* 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 partner early, at least a week before the second assignment is handed out. I will give out the first problem set on Sept. 9, with a hard copy due at the beginning of class on Sept. 14. I will give out the second problem set on Sept. 28, and it will be due on Oct. 1 (put a hard copy in my mailbox in Matherly 224 by 3pm). The final exam will be given during the regular class time in our regular room on October 12. 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.** 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.

- 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!

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.

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.