

# Game Theory and Applications Syllabus

(ECO 4400, Fall 2021)

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Course Prerequisites: ECO 3101 or ECP 3703 and MAC 2233 (or higher calculus)

Textbook: Harrington, J.E., *Games, Strategies, and Decision Making*, 2<sup>nd</sup> edition, Worth Publishers: Macmillan Ed., 2015. Macmillan has sent me a link to their online store, the url being: <https://store.macmillanlearning.com/us>, where they indicate it provides good pricing options for students. Have a look!

Canvas Course Website: The website is used mainly to post some resources for the course. Access to Zoom office hours is at the website as well. Four types of files have and will be posted: (i) Tables/graphs/matrices from the book that we will use in our analysis in class are posted, these files are under Files > Figures and Tables and titled: Figures Chapter X. *It will be very useful for you to download these and have them in class.* (ii) Practice questions from the book are under Files > Practice Questions and Answers and are titled: Practice Problems in Harrington Ch X. *It is crucial that you do these to learn the material.* (iii) Answers to the end-of-chapter problems in the textbook, part of the assigned problems in (ii), are also provided under Files > Practice Questions and are titled: harrington2e\_sm\_chX (more on this below). (iv) Last the syllabus and some handouts are posted under Files > Course Resources. I will also post things like answers to the midterms. Regarding the handouts, I will let you know when you want to read each particular one.

**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 study the basic framework and principles of classic game theory and apply these to a variety of strategic problems. The realm of game theory concerns settings having decision makers preferred (strategy) choices depend on others' (strategy) choices. A variety of environments have this property including economic problems, political competition, social interactions, international relations, military choices, and sports and parlor games. While this is a course in the economics program and we examine many economic problems, a number of applications we examine are not classic economic problems. This is a course in applied theory. Game theory is a branch of mathematics. As such, the course is moderately (perhaps quite) technical. We will use differential calculus at times (to solve continuous optimization problems), and sometimes calculate expected values (when a decision maker's payoff is uncertain).

Learning Game Theory: We will work through many examples of games in class that illustrate how to apply the principles of game theory. It is one thing to follow what we do in class and quite another to do it yourself. It is *essential* to carefully read the book (multiple times), study, and do problems to learn game theory. It is not a matter of applying a bunch of formulas. I have provided problems in the book to do, all with answers available (either in the book itself or at the course website). Sometimes problems and concepts are easy; sometimes not.

Comments on Textbook: The textbook is far and away the best for a serious first course in game theory. It is well written, comprehensive, and has a huge number of good examples and problems. I will follow it quite closely in teaching this class. A caveat about the book is that some of the examples involve stereotyped players, which the author makes clear are stereotyped and not to be taken seriously.

Topical Outline, Tentative Timing,<sup>1</sup> and Textbook Reading<sup>2</sup>:

Topic 1: Introduction, Setting up Games, Rationality and Analyzing Games with Just Rationality  
~ 4 classes; Reading: Chapters 1,2, & 3

Topic 2: Nash Equilibrium and Discrete Games  
~ 4 ½ classes; Reading: Chapters 4 & 5

Midterm 1: September 23

Topic 3: Nash Equilibrium and Continuous Games  
~ 3 classes; Reading: Chapter 6

Topic 4: Mixed Strategies  
~ 2 ½ classes; Reading: Chapter 7

Topic 5: Sequential Games with Perfect Information  
~ 4 classes; Reading: Chapter 8

Midterm 2: October 28

Topic 6: Sequential Games with Imperfect Information  
~ 4 classes; Reading: Chapter 9 (skip 9.5); Chapter 10, just pp. 359-368

Topic 7: Repeated Play  
~ 4 classes; Reading: Chapter 13; Chapter 14 (skip 14.5)

Final Exam: Dec. 13, 10am – noon, room TBA

Grading: The course grade is determined by the performance on the three equally weighted non-cumulative exams (see above for dates). I will consider exceptional classroom participation in determining borderline grades.

Make-up Policy: Students are permitted to make up exams only for good (and documented) medical reasons or real (and documented) family emergencies.

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<sup>1</sup>The classes devoted to each topic are estimates. I will keep you informed as to where we are. I will adapt the coverage if we fall behind. We will stick to the exam dates unless something extraordinary happens.

<sup>2</sup> You are not expected to read any of the appendices to the assigned chapters unless I tell you otherwise.

### 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.

Honor Code: It goes without saying that we adhere to and expect adherence to the Honor Code of the University of Florida.

Students with Disabilities: We are committed to providing accommodations to students with disabilities following the guidelines and procedures of the University of Florida policies.