

ECO 4400—Game Theory and Strategic Decisions

Prerequisite Calculus 1 (MAC 2311), Statistics 1 (STA 2023), or equivalent
Credit Hours 3
Class Meeting W 10-11:50 IST 1062, Weekly Asynchronous Online Assignments
Website <https://floridapolytechnic.instructure.com/courses/NNNN>

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Welcome! Game theory is the study of optimal decisions with uncertainty about what others will choose. It is inherently strategic and social. We won't deal with datasets, but data analysis is often about giving decision makers information to help them apply GAME THEORY to make decisions! Our objective is for you to acquire and hone the ability to apply game theory to think about strategic decisions, particularly with incomplete or imperfect information. This, in turn, will help you think clearly and critically about what questions are important to ask and what information is valuable.

Catalog Course Description An introduction to modern game theory; the study of situations of profound interdependence between a small number of decision makers. Includes Nash equilibrium and other solution concepts, repeated games, and incomplete and asymmetric information. Covers both formal theory and applications such as auctions, oligopoly, entry deterrence, and the work of teams.

Class Delivery The 2-hour in-person meeting will blend lecture, discussion, Q&A, and problem solving. The 3rd credit hour delivered online asynchronously will consist of videos on more straightforward topics and example problems to prepare you for discussion and for more challenging topics and problem solving when we meet in person.

Completing assigned reading before watching videos or attending class **is critical** for two reasons. First, reading will familiarize you with terminology needed to follow lecture and participate in discussion—class time is too valuable to spend on vocabulary. Second, multiple exposures are crucial to learning. Your first exposure comes when you engage with reading, the second when you engage with lecture, the third when you watch me work examples, the fourth when you participate in discussion, the fifth when you work examples, the sixth when you study. Knowledge builds gradually with each. You may find it best to quickly skim before class to pick up terms and orient yourself and then reread difficult parts as you study. You may find it best to read carefully before class. Either is fine—do what works for you. It is easy to put things off even with the best of intentions. To provide an incentive to ensure we are always prepared for class meetings, **quizzes** over assigned preparatory material will be given at the beginning of each class meeting.

Active engagement, not just attendance, is expected. Real learning is active learning. You should listen actively, think carefully, and actively take notes during reading, lecture, and discussion. Attendance, engagement, and communication count toward your grade.

Civility and collegiality. Civility and collegiality mean respecting the right of students and faculty to participate in a welcoming and professional educational environment. Students and faculty are expected to treat one another with civility. Communication—written, oral, and behavioral—must remain respectful. *Within and outside the classroom, students and faculty must refrain from derogatory comments.* Faculty and students should address one another with respect, in accordance with the wishes of the individual. Distracting behavior impedes the education of fellow students, which is disrespectful. Faculty should specify what constitutes behavior harmful to the educational environment.

Textbooks Joel Watson. 2013. *Strategy: An Introduction to Game Theory*. Third Edition.

Revisions to the Syllabus The instructor reserves the right to correct typos or other errors in the syllabus and make other reasonable adjustments to maintain the quality and integrity of the course in response to unanticipated circumstances.

Alignment of Course and Program Learning Outcomes

(Highest Bloom Taxonomy Level Indicated)

Program Learning Outcomes	Course Learning Outcomes		
	(1) Apply game theory to solve well defined problems.	(2) Analyze ill-defined strategic problems using game theory.	(3) Communicate game theoretic analysis clearly.
Data Science			
(1) Identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline.	Apply	Analyze	
(2) Formulate or design a system, process, procedure or program to meet desired needs.	Apply		
(3) Develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.	Apply	Evaluate	
(4) Communicate effectively with a range of audiences.			Create
(5) Understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts.	Apply	Evaluate	
(6) Function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.			
Business Analytics			
(1) Apply current business analytics concepts, techniques, & practices to solve problems.	Apply		
(2) Analyze a business problem using appropriate techniques to generate insights & solutions.		Create	
(3) Effectively communicate insights, analysis, conclusions, and solutions to a diverse audience.			Create

Graded Coursework

Exercises (15%) After coverage of specific topics I will assign exercises, about 3-5 per week, due one week later. Exercises engage you with challenging material to facilitate learning. Expect to invest significant time in them. You are encouraged to work together to help one another learn, but if you don't push yourself to work them on your own before working with other students, you will cheat yourself out of your best chance to learn.

Short Papers (15%) Two brief papers (~6-12 pages) in which you analyze a strategic situation of interest using concepts from class. More details will be on canvas.

Midterm Exams (0 to 30%) There will be 2 midterm exams. They will occur after we finish cohesive blocks of material, so exact dates are TBD and will be announced one meeting in advance. There will be no review of, or questions about, quizzes during the first 50 minutes of the meeting in which they are given, which will be spent on new material.

Final Exam (20% nominal, 20 to 50% actual) TBA during finals week **May 4th – May 8th**. To reward improvement and prevent a single bad quiz day from unduly influencing your grade, the final will replace all lower quiz scores.

In-Class Quizzes (10%) To provide incentive to be prepared, a quiz will be given at the start of each meeting. They will be on your desk at 10:00 and collected at 10:08. Be on time!

In-Class Problems (5%) During each class you will work example problems to reinforce learning. You will submit an image of your work to Canvas each class meeting.

Engagement (5%) Depend upon the instructor's perception of your *participation and engagement in class meetings and online discussions, courtesy, respect, civility, professionalism, questions asked, helping other students*, etc.

Grading

All assessments are open response. All are graded A, B, C, D, on the 4-point GPA scale with partial credit described below, e.g. 2.3 is a C+. Points are entered in the gradebook. Canvas displays percentages, e.g. 2.3 is 58% of 4. I cannot turn that off. That does not mean you got 58% "correct," such a statement is **meaningless**. It only means 2.3 (a C+) is 58% of the way between 0 and 4. Grades may be above 4; think of it as an A+ or extra credit.

Make-up and Late Work

Midterm Exams: The final exam grade replaces missed midterms. There is no other make up. However, you should take them on your own for the learning experience.

Final Exam: If the final is missed, a make-up may be taken **ONLY** with a documented excuse recognized as valid by university policy. Work conflicts **ARE NOT** a valid excuse. Let your employer know now that you need a flexible schedule during finals week.

Exercises and Papers: I accept late assignments with a penalty that is minimal at first but increases with lateness. A 1.7 is the highest grade possible after solutions are released, and to receive it you must demonstrate real engagement, not simply copy the posted solution.

Quizzes, In-Class Problems, and Engagement: There is no way to these up because their entire purpose related to class participation. Instead, the two lowest quiz and in-class problems will be dropped. [Attendance policy](#).

Grade	Points	Criteria
A	4.0	Demonstrates mastery. Complete. Correct approach. Possibly minor math errors but no significant conceptual errors. Well explained & supported. Neat, well organized, clear exposition. Grammatical errors minor.
B	3.0	Demonstrates proficiency but short of mastery. Complete or nearly so. Approach is generally correct, though there may be small conceptual errors. There may be significant mathematical errors if they do not reveal additional conceptual flaws. Explanation and support are clear and reasonable, if not complete or fully correct. Neatness, organization and exposition allow the answer to be easily understood.
C	2.0	Demonstrates basic proficiency with the most important or central components but otherwise incorrect or incomplete. Explanation & support sufficient for the most central or important component, but otherwise incomplete or incorrect. Neatness, organization, and exposition allow the answer to be understood.
D	1.0	Reasonable effort but does not demonstrate proficiency. Relates to the question but largely incorrect. Neatness, organization, and exposition allow the answer to be understood.
F	0.0	No attempt, unresponsive, or too messy to understand.

Exercises Each is assigned and graded individually. Since you have time, neatness and organization count. Since exercises are intended to facilitate, not evaluate, learning, correctness is judged leniently. You must show a good faith effort with supporting work and evidence of careful thought and significant effort. The lowest 3 scores are dropped.

Papers Since work is not timed and we will have covered relevant material, correctness, neatness, organization, and exposition are all judged stringently.

Quizzes and Final Exam Each question is graded individually, and points averaged across questions. Due to the time constraint, neatness and writing quality are judged leniently.

Course Grades The course grade point average (CGPA) is:

$$CGPA = 0.05Engagement + 0.05In\ Class\ Problems + 0.1Quizzes + 0.15Exercises + 0.2Papers + 0.15Max\{Midterm_1, Final\} + 0.15Max\{Midterm_2, Final\} + 0.2Final .$$

Course letter grades are assigned according to the table below. [Policy](#).

Letter Grade	A	A-	B+	B	B-	C+	C	D	F
Minimum CGPA	3.83	3.50	3.16	2.83	2.50	2.16	1.50	0.50	0

Academic Support Resources

Library. You can access the library through the University website and [Canvas](#), on and off campus. Students may direct questions to library@floridapoly.edu.

Tutoring and Learning Center. The Tutoring and Learning Center (TLC), located on the 2nd floor of IST, provides tutoring to Florida Poly students. The TLC is staffed by students who have excelled in the courses they tutor. They offer support by reviewing concepts and materials from class, clarifying points of confusion, and providing assistance with learning strategies. While the focus of TLC is to provide support to students in freshman-level courses, upper-level courses are also tutored.

Knack Tutoring. Students looking for additional assistance outside of the classroom are advised to consider working with a peer tutor through Knack. Florida Polytechnic University has partnered with Knack to provide students with access to verified peer tutors who have previously aced this course. To view available tutors, visit floridapoly.joinknack.com and sign in with your student account.

Academic Success Coaches. All students at Florida Poly are assigned an Academic Success Coach to assist with academic success strategies. Please visit the Student Success Center on the 2nd floor of the IST to meet with an Academic Success Coach.

Writing Center. Located on the 2nd floor of IST (2059/2061), the Writing Center helps students develop writing and presentation skills. Consultations are available in person and virtually. For more visit <https://floridapolytechnic.libguides.com/writingservices>.

Academic Integrity. Violations of Florida Polytechnic's [academic integrity regulation](#) include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to Artificial Intelligence), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the mission of the university and erode the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in sanctions up to and including expulsion from the university.

Recording Lectures Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action). Recording class activities other than lectures, including but not limited to lab sessions, student presentations, discussion (except when incidental to and incorporated within lecture), and invited guest speakers is **prohibited**.

Reasonable Accommodations The University is committed to ensuring equal access to educational opportunities. The Office of Disability Services (ODS) facilitates reasonable accommodations for students with documented eligibility. It is the student's responsibility to identify as a student with disabilities, register with ODS, and request accommodations. If you have registered with ODS, please ensure that you have requested an accommodation letter for this course through the [ODS student portal](#) and communicate with your instructor about your approved accommodations as soon as possible. Accommodations must be arranged in advance and are not retroactive. If you are not registered with ODS but believe you have a condition requiring an accommodation, contact ODS as soon as possible: DisabilityServices@floridapoly.edu, www.floridapoly.edu/disability, (863) 874-8770.

If accommodations call for extended exam time, students starting before the regular time must remain in the proctored environment without communication access until the regular start time, and students starting after the regular time must start before the regular end time.

Accommodations for Religious Observances, Practices and Beliefs The University will reasonably accommodate religious observances, practices, and beliefs in admissions, attendance, and scheduling examinations and work assignments. ([University Policy](#).)

Title IX. Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. Any faculty or staff member you speak to is required to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University [Ombuds Office](#), BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at [Peace River Center](#), 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions and to discuss resources and options.

Course Outline and Schedule: *Tentative and Approximate!*

The Canvas calendar will be updated as we progress.

Chapter	Topic	Week	Exercises ^a
Part I: Introduction and Building Blocks			
1	Introduction	1 (1/14)	
2	The Extensive Form	1 (1/14)	2, 4, 6
3	Strategies and the Normal Form	2 (1/21)	2, 4, 8
<i>Martin Luther King Jr. Holiday Monday January 19th</i>			
4	Beliefs, Mixed Strategies, and Expected Payoffs	3 (1/28)	2, 4
5	General Assumptions and Methodology	3 (1/28)	
Part II: Decisions in Static Settings			
6	Dominance and Best Response	3, 4 (1/28, 2-4)	2, 6, 7
7	Rationalizability and Iterated Dominance	4 (2-4)	2, 3, 4, 6, 7
8	Location and Partnership	5 (2-11)	2, 6, 7, 8
<i>Midterm 1 follows this material.^b</i>			
9	Nash Equilibrium	6 (2-18)	2, 4, 6, 10, 11, 15
10	Oligopoly, Tariffs, Crime, and Voting	6 (2-18)	1, 4, 5, 6, 15
11	Mixed-Strategy Nash Equilibrium	7 (2-25)	3, 5, 6, 8, 13
12	Strictly Competitive Games and Security Strategies	7 (2-25)	1, 2, 5
13	Contract Law and Enforcement	8 (3-4)	1, 2, 12
<i>Paper 1 Due Monday March 9th</i>			
Part III: Decisions in Dynamic Settings ^c			
14	Details of the Extensive Form	9 (3-11)	6
<i>Spring Break March 16th – March 20th</i>			
15	Backward Induction and Subgame Perfection	10 (3-25)	2, 8, 12
16	Topics in Industrial Organization	11 (4-1)	5, X
<i>Midterm 2 follows this material.^b</i>			
22	Repeated Games and Reputation	12 (4-8)	2, 3, 10, 11
23	Collusion, Trade Agreements, and Goodwill	12 (4-8)	1, 6, 8
Part IV: Information ^c			
24	Random Events and Incomplete Information	13 (4-15)	1, 3
26	Bayesian Nash Equilibrium and Rationalizability	14 (4-15)	5, 6, 9
27	Lemons, Auctions, and Information Aggregation	14 (4-15)	1, 4
28	Perfect Bayesian Equilibrium	15 (4-22)	3, 4, 5
29	Job-Market Signaling and Reputation	15 (4-22)	1, 2, 3
<i>Paper 2 Due Monday April 2th</i>			
<i>Final Exam TBD During Finals Week May 4th – May 8th</i>			

^a This is an initial guess at exercises assigned and is subject to change.

^b Midterms are in class after the indicated material is complete, date TDB.

^c Details of coverage in parts III and IV depend heavily on time and interest.