Syllabus: ECONS 356: Game Theory

Fall, 2020, HSSA
Rose-Hulman Institute of Technology

Course Description

Catalog Description
The goal of this class to help students set up and solve games -- especially games encountered in business and economics. Setting up these problems requires developing modeling skills, recognizing the particular type of game, and deriving the solution associated with the form of a particular game. The mathematics of solving these games is similar to calculus, but the solutions may not always be unique. This class introduces use of decision trees, payoff tables, information sets, conditional probability, and Bayes' theorem. Games will be solved in normal form or in the extensive firm. Furthermore, the course provides detailed algorithms for finding the equilibria of games with perfect information, with simultaneous moves, with private information, and with repeated interactions. Both cooperative and noncooperative games are examined.

Course Prerequisites
The prerequisite for this course is either Introduction to Microeconomics (ECONS 151) or its equivalent. Students are expected to have a rudimentary knowledge of calculus and probability. The ability to use and interpret graphs is particularly important.

Credit Hours
4 Credit Hours

Course Format
Hybrid

Course Location (Classroom/Lab)
O269

Instructor Information

Instructor Name and Title
Tanvir Pavel, Visiting Assistant Professor of Economics

Department and Office Location
HSSA, C117

E-mail
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Office Telephone:
812-877-8716

Best Contact Method
Please use email for all course related communications. 24-hour response time (excluding weekends)

Office Hours
Face-to-Face/Online: M T F 12PM-1PM, or by appointment

Short Biography
I am a visiting assistant professor of economics at RHIT. My teaching interests include applied microeconomics, environmental economics, and econometrics. My research interests include environmental and natural resource economics, and applied microeconomics. Prior to RHIT, I worked as a Post-Doctoral Associate and Visiting Faculty in the Department of Economics at Florida International University (FIU). As a Post-Doctoral Associate, I primarily contributed to the National Science Foundation (NSF) awarded project "CRISP 2.0 Type 2: Collaborative Research: Organizing Decentralized Resilience in Critical Interdependent-infrastructure Systems and Processes (ORDER-CRISP)" which focuses on developing an integrated resilience modeling framework for mitigating vulnerabilities in critical interdependent infrastructure systems. In the free time, I enjoy watching sports, especially English soccer, and exploring the outdoors. Taking road trips with his family and friends is one of his favorite pastimes.

Course Details

Course Objectives
After completing this course, students should be able to:
1. Account for the central parts of modern game theory and to explain how this method of analysis can be applied to the strategic interaction among economic agents.
2. Explain the origins and functions of different economic and political economy structures with the help of game theory.
3. Solve practical problems involving strategic interaction for economic agents and to provide an intuitive explanation for the methods used and the results.

Required Course Materials
Joseph Harrington, Games, Strategies, and Decision Making, 2nd ed. (2015), Worth Publishers.

Supplemental Course Materials
Roy Gardner, Games for Business and Economics, 2nd ed. (2003), Wiley and Sons.

Course Policies

Grade Scale

Score in Percentage	Grade
90 or better	A
86 to 89	B+
80 to 85	B
76 to 79	C+
70 to 75	C
66 to 69	D+
60 to 65	D
Below 60	F

Grade Components and Weighting

Grade Component	Weight
Movie/Documentary Review	3%
Eight Homework	32%
Paper describing game theory	10%
Four in-class Exams	40%
Comprehensive Final Exam	15%

A. Movie / Documentary Review
Watch "A Beautiful Mind" or "A Brilliant Madness." Write a short review of the movie/documentary mentioning what makes you to pick a movie over a documentary and vice-versa. Does this movie/documentary make any impression on you? Why or why not? Your writing should not exceed 500 words.

B. Homework
Homework problems are frequently assigned. These are due almost every week on Friday.

C. Paper Describing game theory problem found outside of class
Students will write a paper describing a game theory problem found outside of the class. The problem may be found online, found in pop culture such as a movie, a video game, a song or a novel, or found in another textbook. For inspiration, see the examples from popular culture listed on GameTheory.net (http://www.gametheory.net/popular/). The problem cannot come from Harrington's textbook or previous homework assignments and exams used in this class. After citing where the problem was found, the paper should describe the problem and its solution. If there are no explicit payoffs mentioned in the problem, assign payoffs and solve the problem. The paper's topic must receive prior approval from the professor. Students will turn in a short, one-paragraph memo describing the problem on Tuesday, October 6th via Moodle. Problems similar to those submitted in previous classes will not be approved. The paper describing the solution of the approved topic must be typed, double-spaced, it should be no longer than three pages and it is due on Friday, November 13th. The paper's grade is based on the paper's content, clarity of thought, thoroughness of explanation, originality and logical organization. Late paper will not be accepted.

D. Exams
There are five exams in the class: four in-class exams and a comprehensive final. The exams consist of definitions, problems, short answers, and essay questions. The exams cover both assigned reading and lecture material. The final will be a two-hour, comprehensive exam given during finals week.

Access to Grades
All the Grades (Except the Grades of Exam 4/Final Exam) will be available in the Moodle Gradebook.

Late Assignment / Incomplete Assignment Policy
In case you missed the deadline to upload your answer on time, there will be no extension/ makeup examination. So, please follow the course schedule very carefully.

Attendance Policy
Students are expected to attend all the face-to-face and online session on time. Scoring reductions will be made for students who are absent or consistently tardy. Specifically, 2 unexcused absences will result in a 20% reduction of this grade component score, 4 unexcused

absences will result in a 40% reduction, 6 unexcused absences will result in a 60% reduction. 8 unexcused absences will result in failure of the course. If you believe you have a legitimate reason for missing a class, discuss it with me ahead of time.

Institute Policies

Students with Accessibility Needs
Rose-Hulman is committed to working with students who have special needs or disabilities. Visit the Accessibility Services website for more information. Requests for academic accommodations must be documented with and approved by the Accessibility Services office before they can be implemented in this course.

Academic Integrity:
The Student Handbook and Rose-Hulman's Academic Rules and Procedures describe penalties and processes invoked as a consequence if academic misconduct (such as cheating, plagiarizing, or interfering with the academic progress of other students) takes place. It is the responsibility of each student to know and follow Rose-Hulman's rules about academic integrity.

Diversity Statement:
Rose-Hulman Institute of Technology is committed to being an inclusive community in which the multiplicity of values, beliefs, intellectual viewpoints, and cultural perspectives enrich learning and inform scholarship.

Online Access Requirements:
Rose-Hulman welcomes students from around the world, and encourages faculty, staff and students to travel around the world. However, geopolitical conditions and compliance with export law and regulations prevent us from delivering certain kinds of educational experiences and/or using certain kinds of Institute technologies in some locations. For example, students in locations with limited access to the internet in general, or with restricted access to portions of the internet, or which are embargoed by the U.S. Directorate of Defense Trade, may not be able to successfully complete Rose-Hulman courses.

Emergency Information:
To receive email or text messages regarding emergency situations that may impact campus and, possibly, the delivery of classes, register for RAVE alerts and/or follow @Rose-HulmanAlert on Twitter. Any announcements about the Institute's ability to offer classes will be shared on Rose-Hulman's website.

Course Schedule

The table below lists the order of the material to be covered in this course.

Week/Date	Topics and Textbook Reference	Important Due Dates/Instructions
Week 0: 9/3-9/4	Review the Syllabus Watch "A Beautiful Mind" or "A Brilliant Madness" and write a short review on what makes you to pick a movie over a documentary and vice-versa. Does this movie/documentary make any impression on you? Why or why not?	Movie/Documentary/TV Show Review **Due:9/4 (Via Moodle)**

Week 1: 9/7 – 9/11	Ch. 1: Intro to Strategic Reasoning Ch. 2: Building a Model of a Strategic Situtaion	**Homework 1** (ch. 1,2): Due 9/11
Week 2: 9/14 – 9/18	Ch. 2: Building a Model of a Strategic Situtaion Ch. 3: Solving a Game when Rationality is Common Knowledge	**Homework 2** (ch. 2,3) Due: 9/18
Week 3 9/21 – 9/25	Ch. 4: Nash Equilibria in Discrete Games with Two or Three Players Ch. 5: Nash Equilibria in Discrete n-player games	**Exam 1** (Ch. 1,2,3), in class on 9/21 **Homework 3** (ch. 4,5) Due: 9/25
Week 4: 9/28 – 10/2	Ch. 5: Nash Equilibria in Discrete n-player games Ch. 7: Keep' Em Guessing: Randomized Strategies	**Homework 4 (**Ch. 5,7**)** Due: 10/2
Week 5: 10/5-10/7	Ch. 8: Sequential Games with Perfect Information	**Exam 2** (Ch. 4,5,7), in class on 10/5 One Paragraph **Memo of the paper**, Due; 10/6
10/8-10/9: Fall Break: No Classes		
Week 6: 10/12 – 10/16	Ch. 8: Sequential Games with Perfect Information Ch. 9: Sequential Games with Imperfect Information	**Homework 5 (**Ch. 8,9**)** Due: 10/16
Week 7: 10/19 – 10/23	Ch. 9: Sequential Games with Imperfect Information Ch. 10: Games with Private Information	**Homework 6** (Ch. 9,10) Due: 10/23
Week 8: 10/26 – 10/30	Ch 11: Signaling Games Ch 12: Cheap Talk	**Exam 3** (Ch.8,9,10) will be held on 10/26 (in-class) in class **Homework 7** (Ch. 11,12) Due: 10/30
Week 9: 11/02 – 11/06	Ch 12: Cheap Talk Ch 13: Repeated Interaction with Infinitely Lived Players	**Homework 8** (Ch. 11,12) Due: 11/06
Week 10: 11/9 – 11/13	Ch. 14: Application of Repeated Interaction with Infinitely Lived Players	**Exam 4** (on Ch.11,12,13) will be held on 11/9 in-class. **Final Paper**, Due: 11/13
Final Exam Week: 11/16-11/19	2 hour, comprehensive exam	**TBA**

**** I reserve the right to modify the course content, schedule, topics, policies, etc. outlined in this syllabus.**