GAME THEORY

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1 Preliminaries

Sending me a message online (by email or through Canvas) is the best way to reach me, and I will usually respond within 24 hours. If you would like a more immediate response, you can try calling or sending a text message to 267-416-0292. But don't leave a voicemail. I won't get it.

My available meeting times: by appointment (Webex, 071 College Park, 1050 George Hall)

2 Mississippi State University Syllabus

The Mississippi State University Syllabus contains all policies and procedures that are applicable to every course on campus and online. The policies in the University Syllabus describe the official policies of the University and will take precedence over those found elsewhere. It is the student's responsibility to read and be familiar with every policy. The University Syllabus may be accessed at any time on the Provost website under Faculty and Student Resources: provost.msstate.edu/faculty-student-resources/university-syllabus.

3 Textbook (required)

Resnik, Michael. *Choices: An Introduction to Decision Theory*. ISBN: 9780816614400.

4 Course Description

Three hours lecture. An introduction to decision theory and game theory. No mathematical knowledge beyond high school algebra is assumed. Focuses on modeling strategic decision-making by rational agents with applications to practice and real-world cases. (Credit for this course may be earned only at the Meridian campus).

Games What is a game? This is one definition: *an interaction between two or more players involving some mix of skill and luck*. It's not a perfect definition, but it covers what we think of as games—chess, poker, basketball, tic-tack-toe, and so forth, although we won't discuss these games in this course. (You can, however, apply the methods that you learn in this course to them. Here is a game theoretic analysis of a famous play in the 2015 Super Bowl.) This definition also covers the types of games that we will study in this course.

Here is an example. Imagine sitting down in a classroom full of other students on the first day of the semester. You are given a slip of paper and told to write down either *alpha* or *beta*. You are also told that this will be your "grade bid," and that your slip of paper will be randomly paired with another student's. Neither you nor the other student will ever know with whom you were paired, but you will be given a grade based on these criteria:

If you wrote *alpha* and the other student wrote *beta*, then your score will be 100, and the other student's score will be 75.

If both you and the other student wrote *alpha*, then you both will get an 81.

If you wrote *beta* and the other student wrote *alpha*, then you will get a 75 and the other student will get a 100.

If both you and the other student put *beta*, then you will both get an 89.

Now, don't worry. None of your grades in this course will be determined in this manner. But, if you think through the options, you might decide that, rationally or strategically, one of your options is better than the other. In this course, we will analyze such games (and many others) and learn the rules and methods for "playing" them.

Overview This course introduces students to decision theory and to game theory. Both theories examine and seek to explain how rational agents should act when faced with a choice between two or more actions. Decision theory covers one person making a decision by him- or herself when the outcome is determined by the person's choice and some external factors about which the decision maker is uncertain. Game theory is the related theory that examines decision making by two or more people when the outcome is determined by both people's choices, as in the grade game described above. We will examine the methods used for analyzing decisions and games, and apply those methods to some real world cases—international relations and nuclear deterrence, deciding whether to believe in God, when to break up with your partner, and others.

4.1 Responsibilities

If you are having trouble with any part of this course, please contact me right away. The course is designed to make working through the material and learning it a straightforward process. But, since this is an online course, you are responsible for the following.

1. Making time each week to do the work for the course.
2. Using the textbook and videos to complete the assignments.
3. Determining if and when you need to contact me with questions.

Again, don't hesitate to contact me. It's what I'm here for, and I don't mind answering questions.

5 Learning Objectives

At the end of this course, students will be able to do the following.

1. Explain the terminology and frameworks that are used to analyze decision problems and games.
2. Apply the methods that are used to solve one-player decision problems.
3. Apply the methods that are used to solve multi-player games.
4. Evaluate real world strategic interactions with game theory.

6 Student Honor Code & Academic Misconduct

Mississippi State has an approved Honor Code that applies to all students. The code is as follows:

> As a Mississippi State University student, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do.

Upon accepting admission to Mississippi State University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor Code. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the MSU community from the requirements or the processes of the Honor Code. For additional information, please visit: `http://honorcode.msstate.edu/policy` and `http://students.msstate.edu/studentconduct/`.

To be clear, students who cheat in any way will be penalized. Cheating includes giving as well as receiving help when such help is not explicitly allowed.

Plagiarism and using AI (i.e., a generative AI tool) are both types of cheating. (See also this longer explanation about A.I. in college. It's written for courses where there is a larger writing component than there will be in this one, but it's still applicable.) The best way to avoid anything that might be academic misconduct is to put yourself in a position where you

don't need to cheat or plagiarize. Don't get behind, and if there are things that you don't understand, give yourself time to figure them out or schedule a meeting with me.

Please ask me if you have any further questions about what constitutes academic misconduct. I am happy to answer any questions about what is and is not allowed. But ask me before you do something questionable.

7 Schedule

See the Google calendar in Canvas for the exact schedule.

Week 1	introduction to decision theory
Weeks 2 & 3	strategies in decision theory
Week 4	political applications of decision theory
	Test 1 is due by February 22.
Week 5	maximizing expected value
Weeks 6 & 7	utility theory
Week 8	introduction to game theory
Weeks 9 & 10	Nash equilibrium
	Test 2 is due by April 12.
Week 11	self-interest and cooperation
Week 12	Pascal's wager
Weeks 13 & 14	nuclear deterrence and international relations
Week 15	extensive form games
Exam week	Test 3 is due by May 13.

8 Coursework & Grading

Letter grades will be assigned using this scale: an A is 90.0 - 100 percent, a B is 80.0 - 89.9 percent, a C is 70.0 - 79.9 percent, a D is 60.0 - 69.9, and an F is 59.9 and below. The grades will be set based on this coursework and these percentages:

quizzes: 30 percent
homework assignments: 30 percent
three tests: 40 percent

All of the work for this course is open book and notes (your own notes, not other people's notes). **Other than consulting with the instructor, you are required to do all quizzes, homework assignments, and tests alone and without help.** You can work on the practice quizzes and practice problems with other students.

Because everything in this course builds on what we have done previously, you have to

do every assignment. (In Canvas, the modules are organized by week—i.e., the first module is for week 1, the second module is for week 2, etc. Except for the first one, each module will only become available once you have submitted the quizzes, homework assignments, or tests in the previous module.) Assignments can be completed after their due dates, but 3 percent will be deducted from an assignment's grade for each day that it is late.
Most weeks, the assignments will be on this schedule:

11:30 pm Friday: Quiz 1 due
11:30 pm Sunday: Quiz 2 due
11:30 pm Sunday: One or two assignments due

Three assignments that won't be on this schedule are required meetings with me. These meetings will be shortly before each test, and their purpose is to make sure that you understand the material and prepared for the test. For students in Starkville, the expectation is that the meetings will be in-person in George Hall. For students in Meridian, the meetings will most likely be on Webex.

Each student's two lowest quiz grades and lowest (i.e., one lowest) homework grade will be dropped. There will not be any extra credit at the end of the course, and so you should do as well as you can throughout the semester.

Honorlock You will use the proctoring software Honorlock for some of the tests. There is information about using it on Canvas, but right now, you should make sure that you have a working webcam—either the webcam built into your laptop or an external one (which doesn't have to be HD or otherwise fancy).