POL SCI 505: Theories of Individual and Collective Choice I (Fall 2019)[1][2]

Tuesdays 2:30 PM – 4:20 PM Seigle Hall Room 104

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COURSE DESCRIPTION: This course provides an overview of game theory and its applications to political science. We start from the ground floor, assuming no prior exposure to game theory or mathematics beyond high school algebra. Students are introduced to game theoretic concepts such as Nash equilibrium, time-consistency, and signaling. These concepts will be applied to examine a variety of political phenomena, including candidate competition and bargaining between the branches of the government. While some of the applications of game theory that we explore will be political in nature, some of our applications will be drawn from the world of economics and every-day life.

This course has four objectives:

1. The first objective is to introduce you to some of the more popular methods of solving games employed by game theorists.

2. The second objective is to provide the necessary background for you to both appreciate and critically analyze political science scholarship employing game theoretic models.

3. The third objective is to increase your ability to express your arguments in an organized and compact manner.

4. The fourth objective is to provide a foundation for conducting your own scholarship using game theory.

[1] I reserve the right to update this syllabus in any way.
[2] Last updated August 27, 2019to reflect change in office hour times.

To get a broad overview of the game-theoretic concepts we will cover, you might take a look at Robert Gibbon's "An Introduction to Applicable Game Theory," published in the *Journal of Economic Perspectives.*

COURSE WEBSITE: TBA.

COURSE BOOK: The following books are required:

- Martin J. Osborne. 2004. *An Introduction to Game Theory.* Oxford University Press. (primary)
- Tadelis, Steven. 2013. *Game Theory: An Introduction.* (secondary)
- Humphreys, Macartan. 2017. *Political Games.* (secondary)

CLASS FORMAT: This course will have a lecture format. That said, I will try to encourage class discussions from time to time. Moreover, on a couple of occasions, I may ask you to break into small groups to do "group work" or play an actual game with each other. Since the lecture notes for this course will not be distributed, if you must miss a class, you should plan to get a copy of the class notes from a classmate. Two additional items: First, we are an inclusive learning environment (more below). Second, this class is a "screens down" and electronic devices off environment.

SECTIONS: This class has weekly sections. Ipek will coordinate with coordinate with you to select one of the following times:

Thursday	10:00 AM – 11:20 AM	Simon Hall Room 017
Thursday	1:00 PM – 2:20 PM	Seigle Hall Room 104

EMAIL POLICIES: Wustl email accounts must be used for all electronic correspondences with myself or the AI. Under normal circumstance, we'll reply to your e-mail concerning clerical matters within 72 hours. If your concern is more of a substantive nature (i.e., concepts, definitions, problem sets), then you should bring those matters to class, section, or office hours.

OFFICE HOURS AND SECTIONS: We're here to help you learn. As such, I strongly encourage you to take advantage of office hours and sections. Office hours and sections are one of the best resources available for learning outside of the classroom.

COURSE WORK:

1. *Problem Sets.* You are expected to complete the assigned problem sets. A typical problem set will have four to eight "math-like" questions (some of which are multi-part). Many of the problems will be assigned from the course textbooks. That said, on a handful of occasions, one or two of the problems on a problem set may require you to read and analyze an academic article or book chapter that employs game theory or game-theoretic reasoning, or to read and analyze a news analysis of current events.

   Collaborating on problem sets is encouraged; however, each student must write up their solutions in their own words. For any given problem, you should indicate any students or instructors (including myself and Ipek) that you collaborated with in coming up with the solution. You should also indicate *any* resources other than the course textbook (e.g., Wikipedia, online videos, game-theory textbooks other than Osborne, the problem set of a student who has already taken this course, etc.) that you used in coming up with the solution.

   Problem sets will be distributed Tuesday evening and will be due by the start of the following Tuesday's class.

   Each problem set will be weighted equally, and your performance on problem sets will comprise 25 percent of your course grade.[3]

   Additional policies concerning problem sets:

   - Turning in problem sets. All students unable to make it to class to turn in their problem set should e-mail an electronic version to me (justin.fox@wustl.edu) *and* Ipek Sener (isener@wustl.edu) by 2:30 PM of the Tuesday in which it is due.
   - Late problem sets. Problem sets turned in after 2:30 PM of the Tuesday that they are due are docked .25 course points. Further, for every 24 hours past the due date which a problem set is turned in, an additional .5 course points are docked. Note, for the first two assignments turned in late, no penalties are incurred until 48 hours after the due date. After 48 hours, .25 count points are docked, and every additional 24 thereafter, an additional .5 points are docked.
   - Homework regrade requests. In the event that you feel that an error was made in grading a problem set, you have two weeks from the day it was due to bring your concern to Ipek Sener's attention. (Under normal circumstances, problem sets will be returned in section, and so this will give you over a week to make an appeal.)

[3] More specifically, problem sets will be worth a total of 25 "course points." So, if there are 10 problem sets, each one will be worth 2.5 course points, and if there are 12, each one will be worth approximately 2.08 course points.

- Solutions manuals. Solution manuals for the problem sets will not be distributed. Hence, it is your responsibility to make sure you understand the answer to each question. If after section, you are still not sure of what constitutes a good answer for a question, you should consult with myself, the course assistants, or fellow classmates. That said, our textbook's author (Martin Osborne) has provided solutions for some of the textbook's exercises. They can be found at http://www.economics.utoronto.ca/osborne/igt/solsp6.pdf.

2. *Three exams.* There will be two in-class, fifty-minute midterm exams and a two-hour final exam. The first midterm will be on **Tuesday, October 8**. The second midterm will be on **Tuesday, November 19**. The final will be on **Wednesday, December 18**, from 3:30 PM – 5:30 PM . *The final exam is cumulative.*

   Some policies concerning exams:

   - Test-taking procedures. All exams are closed-book, closed-note, no calculators, and electronic-devices off. The only person you are allowed to communicate with during the exam (verbally, electronically, etc.) is myself.
   - Make-up policy. Generally, there will be no make-up exams offered. There are two exceptions to this policy. First, if you are participating in a university sanctioned event at the time of the exam. Second, you face an extremely serious health/family issue that prevents you from taking the exam (the issue would be something serious enough that you'd be talking to all your professors/advisors/deans about the course work you'd be missing and how you'd make it up). In the event you cannot take the mid-term at the scheduled time, I may write a separate exam for you. And in the event that a make-up final exam is needed, a new exam will be prepared and will be administered at the start of the spring semester.
   - Re-grade policy. Sometimes errors are made in grading exams. We will provide an answer key for all exams. The first step is to compare your answers to the answer key.
     - For the midterms, if you think an error was made in grading, you have one week from the time that I return the midterm to the class to request a regrade. To request a regrade, you must return your exam to me with a written explanation as to the mistakes you believe were made. I, along with the original grader of the question (which may have been myself), will take a second look at the items flagged to us.
     - There may or may not be an option for regrades on the final due to logistical considerations.

CALCULATING COURSE GRADE: Your final grade will be determined by your performance on your problem sets and exams. Specifically, I will calculate a "problem set score" and an "exam score."

- Calculating the problem set score. Problem sets will be worth a total of 25 "course points." So, if there are 10 problem sets, each one will be worth 2.5 course points, if there are 11 problem sets, each one will be worth approximately 2.27 course points, etc. Notice that the maximal problem set score is 25.

- Calculating the exam score. Each midterm will be worth 25 points. The final will also be worth 25 points, but will count twice. Your exam score score will be calculated by taking the sum of your three best test scores. For example, suppose you get a 23 on the first midterm, a 20 on the second midterm, and a 25 on the final. Then your set of test scores will be $\{23, 20, 25, 25\}$. In this case, I will effectively "drop" the second midterm, and your exam score will be 23+25+25=73. Alternatively, suppose that you get a 23 on the first midterm, a 20 on the second midterm, and an 18 on the final. Then your set of test scores will be $\{23, 20, 18, 18\}$. In that case, your exam score will be 23+20+18=61. The aim of this grading system is to incentivize learning throughout the semester while at the same time allowing for the possibility of having an off-day. Notice that the maximal exam score is 75.

- Calculating the course grade. I'll sum your problem set score and your exam score to get a total score. The maximal total score is 100 points. To calculate the course grade, I will compare your total score to grade cutoffs which will be determined after final exams have been graded. That said, a student with a total score of 94 points or more is ensured to receive at least an A. Further, any student receiving 90 points or more is ensured to receive at least an A-. Any student receiving 80 points or more is ensured to receive at least a B-. Any student receiving 70 points or more is ensured at least a C-. Any student receiving 60 points or more is ensured at least a D-.[4]

  Student taking the course pass/fail must receive a letter grade equivalent of D- or above in order to pass.

MATHEMATICAL PREREQUISITES: There are no mathematical pre-requisites for the course. All of the math you need to know to do well on the exams for this course is in Chapter 17 of Osborne. That said, on a handful of occasions (e.g., strategic form games with continuous actions), the solution is most easily found using calculus and this is the approach I will adopt in class. However, as the textbook illustrates, in

[4] All claims about cutoffs and letter grades assume attendance of BOTH mandatory sections.

those situations we encounter where calculus may be helpful, one can sometimes use a graphical / algebraic approach instead (See Osborne, pp. 495–498).

LEARNING GAME THEORY: My advice is the following: Take good notes. Read the selected chapters from Osborne before class. When reading, focus on the definitions and the illustrative examples. After class, re-write your notes and re-read the assigned readings, again focusing on the definitions and the key concepts. Time permitting, carefully work through a couple of the more involved examples in the textbook.

Immediately after a problem set is assigned, read over the problems and spend an hour or two thinking about the answers. Perhaps talk to your classmates about possible approaches to getting a problem started. And upon having such preliminary discussions, complete the problems to the best of your ability.

Mastering game theory, like anything else, involves hard work. It's normal to struggle with definitions, to be unsure how to start a problem on a problem set. That said, with practice, you'll get a better handle on everything. Please take advantage of sections and office hours to fill in any gaps in your understanding of the homework and class material.

ADDITIONAL ITEMS[5]

1. **ETHICS/VIOLATIONS OF ACADEMIC INTEGRITY:** Ethical behavior is an essential component of learning and scholarship. Students are expected to understand, and adhere to, the Universitys academic integrity policy: wustl.edu/policies/undergraduate-academic-integrity.html. Students who violate this policy will be referred to the Academic Integrity Policy Committee. Penalties for violating the policy will be determined by the Academic Integrity Policy committee, and can include failure of the assignment, failure of the course, suspension or expulsion from the University. If you have any doubts about what constitutes a violation of the Academic Integrity policy, or any other issue related to academic integrity, please ask your instructor.

2. **INCLUSIVE LEARNING ENVIRONMENT STATEMENT:** The best learning environment—-whether in the classroom, studio, laboratory, or fieldwork site—is one in which all members feel respected while being productively challenged. At Washington University in St. Louis, we are dedicated to fostering an inclusive atmosphere, in which all participants can contribute, explore, and challenge their own ideas as well as those of others. Every participant has an active responsibility to foster a climate of intellectual stimulation, openness, and respect for diverse perspectives, questions, personal backgrounds, abilities, and experiences, although instructors bear primary responsibility for its maintenance.

   A range of resources is available to those who perceive a learning environment as lacking inclusivity, as defined in the preceding paragraph. If possible, we encourage students to speak directly with their instructor or TA about any suggestions or concerns they have regarding a particular instructional space or situation. Alternatively, students may bring concerns to another trusted advisor or administrator (such as an academic advisor, mentor, department chair, or dean). All classroom participants—including faculty, staff, and students—who observe a bias incident affecting a student may also file a report (whether personally or anonymously) utilizing the online Bias Report and Support System

3. **DISABILITY RESOURCES:** If you have a disability that requires an accommodation, please speak with instructor and consult the Disability Resource Center at Cornerstone (cornerstone.wustl.edu/). Cornerstone staff will determine appropriate accommodations and will work with your instructor to make sure these are available to you.

[5]All language and text in this section (pp. 7–9) of this syllabus) is adopted from Wash U's Teaching Center's syllabus template at `http://bit.ly/2c9aN9w`

4. **THE UNIVERSITYS PREFERRED NAME POLICY FOR STUDENTS:** Additional resources and information, may be found here: registrar.wustl.edu/student-records/ssn-name-changes/preferred-name-policy/preferred-name-policy-student/ .

5. **SEXUAL ASSAULT:** The University is committed to offering reasonable academic accommodations to students who are victims of sexual assault. Students are eligible for accommodation regardless of whether they seek criminal or disciplinary action. Depending on the specific nature of the allegation, such measures may include but are not limited to: implementation of a no-contact order, course/classroom assignment changes, and other academic support services and accommodations. If you need to request such accommodations, please direct your request to Kim Webb (kim_webb@wustl.edu), Director of the Relationship and Sexual Violence Prevention Center. Ms. Webb is a confidential resource; however, requests for accommodations will be shared with the appropriate University administration and faculty. The University will maintain as confidential any accommodations or protective measures provided to an individual student so long as it does not impair the ability to provide such measures.

   SEXUAL ASSAULT REPORTING: If a student comes to me to discuss or disclose an instance of sexual assault, sex discrimination, sexual harassment, dating violence, domestic violence or stalking, or if I otherwise observe or become aware of such an allegation, I will keep the information as private as I can, but as a faculty member of Washington University, I am required to immediately report it to my Department Chair or Dean or directly to Ms. Jessica Kennedy, the Universitys Title IX Coordinator. If you would like to speak with the Title IX Coordinator directly, Ms. Kennedy can be reached at (314) 935-3118, jwkennedy@wustl.edu, or by visiting her office in the Womens Building. Additionally, you can report incidents or complaints to Tamara King, Associate Dean for Students and Director of Student Conduct, or by contacting WUPD at (314) 935-5555 or your local law enforcement agency. You can also speak confidentially and learn more about available resources at the Relationship and Sexual Violence Prevention Center by calling (314) 935-8761 or visiting the 4th floor of Seigle Hall.

6. **BIAS REPORTING:** The University has a process through which students, faculty, staff and community members who have experienced or witnessed incidents of bias, prejudice or discrimination against a student can report their experiences to the University's Bias Report and Support System (BRSS) team. See: brss.wustl.edu

7. **MENTAL HEALTH:** Mental Health Services' professional staff members work with students to

resolve personal and interpersonal difficulties, many of which can affect the academic experience. These include conflicts with or worry about friends or family, concerns about eating or drinking patterns, and feelings of anxiety and depression. See: shs.wustl.edu/MentalHealth

PRELIMINARY COURSE OUTLINE[6]

WEEK 1: AUGUST 27

Topics: Overview of syllabus

WEEK 2: SEPTEMBER 3

Topics: Preferences, decision making, decision making under uncertainty, strategic form games, dominance relationships

Readings: Chapter 1, Chapter 17 (pp. 493–499),[7] and Chapter 2 (pp. 13–26), Chapter 4 (pp. 146–150)

WEEK 3: SEPTEMBER 10

Topics: Nash equilibrium and classic strategic situations

Readings: Chapter 2 (pp. 26–35), Chapter 2 (pp. 45–50),

WEEK 4: SEPTEMBER 17

Topics: Solving Nash equilibrium and best-response formulation of Nash equilibrium, introduction to Mathics/Mathematica

Readings: Chapter 2 (pp. 35–45), Chapter 3 (pp. 70–76)

WEEK 5: SEPTEMBER 24

Topics: Mixed strategies and mixed strategy Nash equilibria

Readings: Chapter 4 (pp. 99–122, 137–142)

WEEK 6: OCTOBER 1

Topics: Extensive form games, Nash equilibrium and its weaknesses.

Readings: Chapter 5 (pp. 153–164)

WEEK 7: OCTOBER 8

Topics: First midterm plus time-consistency, subgame perfect equilibrium, extensive form games with simultaneous moves and/or moves by chance

Readings: Chapter 5 (pp. 164–180), Chapter 7 (pp. 205–213 and pp. 225–230)

[6]While all exam dates are fixed, it is quite possible that the rate at which material is covered, or the order in which material is presented, differs from the outline below.

[7]Read up to section 17.5.

WEEK 8: OCTOBER 22

Topics: The "setter model" and its application to separation of powers; the hold-up problem as applied to delegated policymaking and other applications

Readings: Chapter 6 (pp. 181–187)

WEEK 9: OCTOBER 29

Topics: Extensive games with imperfect information, weak sequential equilibria

Readings: Chapter 10 (pp. 313–331)

WEEK 10: NOVEMBER 5

Topics: Applications of weak sequential equilibria (e.g., job-market signaling, political agency models)

Readings: Chapter 10 (pp. 336–357)

WEEK 11: NOVEMBER 12

Topics: Repeated games

Topics: Chapter 14

WEEK 12: NOVEMBER 19

Topics: Second midterm; more on repeated games

Readings: Chapter 15

WEEK 13: NOVEMBER 26

Topics: Bayesian games

Readings: Chapter 9

WEEK 14: DECEMBER 3

Topics: TBA

Readings: TBA