Welcome to Poli Sci 30!
Poli Sci 30 is an introductory course in game theory, aimed at Political Science majors. This quarter’s class mixes online and traditional elements. The hybrid format is intended to combine flexibility of online classes with the structure and support of face-to-face interaction. Video lectures, unit quizzes, homework and peer review assignments are online. Discussion sections, exams and weekly workshops will be face-to-face.

What is Poli Sci 30 about?
Game theory is a mathematical framework for studying strategic situations, situations in which people with conflicting goals do what they can to further their goals, each trying to anticipate what others will do, aware that others are trying to anticipate them. In a strategic situation, I am trying to outwit you, knowing that you’re trying to outwit me, knowing that I’m trying to outwit you…etc. It gets complicated.

Game theory helps us manage the complexity of strategic situations by analyzing them systematically. Developed by applied mathematicians in the mid-twentieth century, game theory is now widely used by social scientists in political science, economics, and other disciplines. We will not be concerned in Poli Sci 30 with the mathematical theorems that provide its foundation. (There are courses in the mathematics and economics departments along these lines, for those who are interested.) Rather, our focus will be on using game theory to understand politics and political strategy.

What will you learn?
In each module, you will learn how to apply game theoretic techniques to real world problems. You will learn to translate a given scenario into a game theoretic model, analyze the model and interpret the analysis in meaningful ways. In doing so, you will learn to understand social interactions in terms of the goals and choices of individual people, that is, in terms of what each person wants and what each person can do. You will learn how individual incentives can (sometimes) work against the interests of the group, and what can (sometimes) be done about it.

You will also learn to be more aware of the assumptions you make when thinking about political and social interactions. You will learn to use mathematical models to communicate those assumptions and explore their logical consequences.
How will the course work?
In a typical week, you will do the following:

1. Complete two online units (videos plus quizzes, lecture notes and textbook sections.)
   Required. Units close on Tuesdays and Thursdays at noon. In order to get credit for a quiz, you must complete it before the unit closes.

2. Turn in a homework assignment online and offer peer review comments on the assignments of two other students. Required. Homeworks are due on Tuesdays before noon. Peer reviews are due on Thursdays before noon.

3. Participate in your assigned face-to-face discussion section, led by your TA. Required. You must attend the section in which you are enrolled. NOTE: Sections begin second week (April 12-13.)

4. Participate in a face-to-face workshop, led by Professor Bawn. Strongly recommended. Workshops take place Thursdays at 2:00pm in Rolfe 1200.

There will be three in-class exams: one midterm on Tuesday, May 1, 2:00-3:15, a second midterm on Thursday, May 24, 2:00-3:15, and a final exam on Wednesday, June 13, 8:00-11:00am. Please do not sign up for PS 30 if you cannot take the exams at the scheduled times.

You have some flexibility about when and where you watch the lectures, do the quizzes, etc. But this is not a self-paced course! You will have noon deadlines every Tuesday and Thursday. See the Course Schedule for details on what is due when.

Most weeks, you will come to class on Thursday for workshop at 2pm and either later Thursday or Friday for discussion section. There are two exceptions, however.

- In Week 1, we will meet on Tuesday (4/3) but not on Thursday (4/5).
- In Week 5, we will meet on both Tuesday (5/1) and Thursday (5/3)

Units and Lessons
The material we will cover is broken down into 14 units. Each unit is composed of 3-4 lessons and 2 quizzes.

Each lesson is a video with accompanying lecture notes. The lessons demonstrate basic game theoretic techniques, showing how they can be applied to help us understand real world problems. The video lessons are typically 15-20 minutes long and contain the content that would be delivered in a traditional lecture. You can watch them as often as you like. The lecture notes follow the video lectures quite closely. The textbook covers the same material, but explains it in somewhat different ways and offers different examples.

Quizzes
Each unit has a Diagnostic Exercise, intended to be taken before viewing the lessons, and an Evaluation Quiz, intended to be taken afterward.

The point of the Diagnostic Exercises is to show you what we expect you to learn from the upcoming unit, and to help you identify the most important concepts as you watch the videos. You should not feel embarrassed or concerned if you answer “Don’t Know” to the Diagnostic Exercise questions. You will receive one participation point for each Diagnostic Exercise you complete before the unit closes, regardless of whether your answers are correct or not.

The point of the Evaluation Quizzes, in contrast, is to check your understanding of the material at the end of each unit, after watching the videos, going through the lecture notes and reading the textbook. Questions are similar to the Diagnostic Exercises, but now you should expect yourself to be able to answer them correctly. Evaluation Quizzes count for 5% of your course grade.
Here are some other things to keep in mind about quizzes. (1) You will need to spend a few minutes setting up and solving the games on paper before answering the multiple choice questions. (2) In order to get credit for the quizzes, you must finish them by the unit’s closing time (noon on Tuesday or Thursday mornings, see Course Schedule.) (3) You will get participation credit for simply submitting the Diagnostic Exercise; your grade is not affected by whether the answer is right or wrong. Your grade on the Evaluation Quizzes depends on whether the answer is right or wrong on your first attempt.

**Homework and Peer Review** The homework assignments will give you practice using game theoretic models to analyze real world scenarios. These problems are similar to those you will solve on the midterms and final exam. You will upload your homework assignments to the course website, where they will be reviewed by other students and by your TA. Homeworks are due by noon on most Tuesdays.

Homework assignments count for 10% of your course grade. They are graded mostly on effort, though you will receive feedback about accuracy from other students and from the TA. The point of the homework assignments is to practice the skills and analysis you will need for the midterm and final exams.

After you upload your homework assignment, you will be directed to two of your fellow students' assignments for peer review. Your job as a peer reviewer is to offer constructive comments that will help the other student master the concepts, and to improve their performance on future homework assignments and on the exams. You will be given an answer key to help you with this. Your peer review performance is part of your participation grade. You should use the answer key to go over your own homework as well.

**What’s not online?**
The face-to-face components of PS 30 are important for understanding how to apply game theoretic ideas to real world situations.

**Discussion Sections** Discussion sections are an opportunity to ask questions and go over problems in a small group. You must attend the Discussion Section in which you are enrolled. Your TA’s evaluation of your contribution in Section is part of your overall participation grade.

**Workshops** Each week, Professor Bawn will lead a workshop focusing on setting up and solving a game using techniques necessary for the following week’s homework. Workshops take place Thursdays at 2:00 in Rolfe 1200, beginning on April 12 (2nd week)

**Exams** Your grade is mostly determined by your performance on the midterms exams and the final exam. All the other course activities (quizzes, homeworks, peer review, section, workshops) are designed to prepare you to do well on the exams.

<table>
<thead>
<tr>
<th>Exam</th>
<th>Date</th>
<th>Time</th>
<th>Location</th>
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<tbody>
<tr>
<td>Midterm 1</td>
<td>Tuesday, May 1</td>
<td>2:00-3:15pm</td>
<td>Rolfe 1200</td>
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<tr>
<td>Midterm 2</td>
<td>Thursday, May 24</td>
<td>2:00-3:15pm</td>
<td>Rolfe 1200</td>
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<tr>
<td>Final</td>
<td>Wednesday, June 13</td>
<td>8:00-11:00am</td>
<td>Location TBD</td>
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Both the midterm and final are in-class exams. Please do not sign up for PS 30 if you cannot take the exams at these times.
Other Course Information

Textbook You should buy a copy of *Games of Strategy* by Avinash Dixit, David Reilly and Susan Skeath. Page numbers on the syllabus refer to the 4th edition.

Math Prerequisites The only math that you need for PS 30 is algebra, but you really do need it. We won’t use calculus in this class (though if you want to study game theory beyond the introductory level, you will need calculus.) Algebra is a pretty basic topic. If you’ve been admitted to UCLA, you must have learned it at some point in middle school or high school. But if you have forgotten how to do algebra -- that is, forgotten how to set up and simplify equations to solve for variables -- then you are going to have a great deal of difficulty with this class.

There is a math self-test problem posted on the course website that will allow you to check whether your algebra skills are where they need to be for PS 30. If you can’t solve the self-test problem, you should not take this class.

Grading Your course grade is based on the following

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Participation</td>
<td>10%</td>
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<tr>
<td>Homework assignments</td>
<td>10%</td>
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<tr>
<td>Evaluation Quizzes</td>
<td>5%</td>
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<td>Midterm 1 May 1</td>
<td>20%</td>
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<td>Midterm 2 May 24</td>
<td>20%</td>
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<tr>
<td>Final Exam Jun 13 8:00-11:00am</td>
<td>35%</td>
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In calculating the homework part of your final grade, we will drop the lowest of your scores. In calculating the quiz portion, we will drop the lowest two scores. This means that if sickness, or any kind of personal emergency, keeps you from turning in one assignment (or two quizzes) on time, that score will simply be the one that is dropped. *Because the lowest homework score will be dropped, late assignments will not be accepted for any reason, no matter how compelling.*

Collaboration and Academic Integrity You are encouraged to form study groups and discuss homework problems with other students. However, you must write up your homework assignments alone. The main point of the homework is to prepare yourself to take the final exam. A good rule of thumb is to make sure that you have a solo study session before and (especially) after a study group session. You should not turn in a homework assignment written during a group session. If we have reason to suspect that someone is turning in someone else’s work or group work as their own, we will refer all students involved to the Dean. This policy applies to quizzes and exams as well.

A small lapse in academic integrity can have very severe consequences. If you have questions about what is acceptable, please talk to Professor Bawn. See also the Dean of Student’s Guide to Academic Integrity: [http://www.studentgroups.ucla.edu/dos/assets/documents/StudentGuide.pdf](http://www.studentgroups.ucla.edu/dos/assets/documents/StudentGuide.pdf)

Grading Disputes If you have a good reason to believe an exam was graded incorrectly, you may dispute the grade, but only through the following process. First, wait at least 24 hours but no more than one week after the exam is returned to you. Second, explain in writing why the exam was not graded correctly. Third, return the exam to your TA, along with the written explanation, to have the grading checked. Note that the entire exam will be re-graded, which may result in a lower score than originally given. Do not attempt to dispute your grade unless you can clearly show that something marked incorrect is actually correct. Disputes based on grades you have received in the past, or on your opinion about appropriate levels of partial credit are not germane. If you submit a frivolous grade dispute (i.e., one that does not follow the above guidelines), we will deduct points from your participation score. Finally, if you make any attempt to dispute or negotiate about grades in person, rather than in writing, you forfeit your ability to request that the grade be reconsidered.
Course Schedule by Topic

All readings are from Games of Strategy 4th ed. by Dixit, Skeath and Reilly (DSR).

Introduction. What is game theory?
Reading: DSR, Chs 1-2. Chapters 1 and 2 contain descriptive, introductory material – you should be able to read them fairly quickly.

Unit 0: Intro
   Video Lesson 1: What is Game Theory?

Unit 0, unlike all those that follow, has no Diagnostic Quiz or Evaluation Quiz. If you are unsure about whether your algebra skills are at the level they need to be for this class, try the math self-test problem.

Apr 1 (T): Organizational meeting in Rolfe 1200 2pm. We’ll discuss the logistics and expectations of the online hybrid course, the pro’s and con’s of online learning and offer some tips on how to do well in Poli Sci 30.

Topic I. Sequential Games: Look forward, reason backward.
In sequential games, players make their choices one at a time. If the first player is strategic, she will anticipate how the second player will react to the first player’s choices. Anticipating your opponent’s reaction is a key part of thinking strategically.

Reading: Ch. 3 and Appendix 1 of Ch. 7 (pp. 251-260)
Now that we’re in Chapter 3, we’re doing “real” game theory. At this point, it becomes important to read more slowly and carefully, working the examples out on paper as you go.

Unit 1: Basics of Sequential Games. Quizzes close Apr 5 (Th) noon
   Video Lessons
   2. Setting Up a Sequential Game
   3. Solving a Game with Backward Induction
   4. What Do We Get?

NO THURSDAY WORKSHOP WEEK 1.

Unit 2: Core Concepts Quizzes close Apr 10 (T) noon
   Video Lessons
   5. Pay-offs and Utility: Comparing Apples and Oranges
   6. Strategies vs. Actions
   7. Counting Strategies
   8. Equilibrium vs. Outcomes

Unit 3: Variable Pay-offs Quizzes close Apr 23 (Th) noon
   Video Lessons
   9. Using Variables to Represent a Family of Games
   10. Solving Games with Variable Pay-offs: Analyzing Cases
   11. Knife-edge Cases

Workshop #1 Apr 12 2pm. Workshops meet Thursdays at 2:00 in Rolfe 1200.
Homework 1 due Apr 17 (T) noon. Peer Review due Apr 19 (noon).
Topic II. Simultaneous Move Games: Have no regrets.
What if the players make their choices at the same time? Or if the second player doesn’t know what the first player has chosen?

Reading: DSR Ch. 4.
In chapter 4, we learn how to analyze simultaneous games.

Unit 7: Prisoners’ Dilemma Quizzes close Apr 26 (Th) noon
Video Lessons
23. Prisoners’ Dilemma
24. Dominant Strategies
25. What Makes a Game A Prisoner’s Dilemma?
26. Beyond the PD: The Limits of Dominant Strategies

Unit 8: Nash Equilibrium Quizzes close May 3 (Th) noon
Video Lessons
27. Nash Equilibrium
28. Assurance Game
29. Battle of the Sexes
30. Multiple Equilibria: Coordination Games and Focality

Workshop #4 May 4 32pm.
Homework 3 due May 8 (T) noon. Peer Review due May 10 (Th) noon.
There are strategic situations in which players do best by behaving unpredictably. By finding mixed strategy equilibria, we can analyze situations in which unpredictability is strategically valuable – even if we (like the players) cannot precisely predict what will happen.

Reading: DSR Ch. 7 (sections 1-5, 8-9)
Dixit and Skeath teach a slightly different way of finding the MSNE than I will in class. Both methods will get you to the same answer, and you should be able to see that they are equivalent. We will not cover mixing among more than two pure strategies (skip sections 5-6 of Ch. 7.)

Unit 9: Mixed Strategies, Part 1 Quizzes close May 8 (T) noon
Video Lessons
31. NE in Pure Strategies: Cops and Robbers
32. Mixed Strategies and the Logic of MSNE
33. Comments on MSNE

Unit 10: Mixed Strategies, Part 2 Quizzes close May 10 (Th) noon
Video Lessons
34. Games with PSNE and MSNE
35. Games with PSNE and no MSNE
36. Interpreting MSNE
37. Final Thoughts on Cops and Robbers

Workshop #5 May 10 (Th) 2pm.
Homework #4 due May 15 (T) noon. Peer Review due May 17 (Th) noon.

Topic IV. Subgame Perfect Nash Equilibrium: Beware noncredible threats.
Some sequential games have more Nash equilibria than the ones we find with rollback. One way or another, these additional equilibria depend on noncredible threats. How much attention should we pay to them?

Readings: DSR Ch. 6. Sections 6.1 and 6.2 basically give you a chance to reinforce and review ideas from earlier topics. Section 6.3(b) covers the topic of subgame perfection.

Unit 11: Subgame Perfect Nash Equilibrium Quizzes close May 17 (Th) noon
Video Lessons
38. Sequential Games in Normal Form
39. Unreasonable NE?
40. Nash Equilibrium, Rollback, SGPE

Workshop #6 May 17 (Th) 2pm
Homework #5 due May 22 (T) noon. Peer Review due May 24 noon.

MIDTERM #2: MAY 24 (Th)
2:00-3:15pm
Covers Units 7-11.
Topic V. Repeated Interaction: The “Shadow of the Future.”
The Prisoners’ Dilemma is justifiably famous because cooperation problems are so important to human interaction. Common sense tells us that, contrary to the Prisoners’ Dilemma prediction, people do sometimes manage to cooperate despite the incentive to defect. What is missing? One obvious missing factor is what might happen in future interactions. How can we expand game theory to encompass issues beyond short term pay-offs?

Reading: DSR Ch. 10 (sections 1-2 and appendix)
Section 10.2 and the appendix to this chapter will help us think about how to compare long-term and short-term strategic incentives.

Unit 12: Repeated Games and the Shadow of the Future Quizzes close May 29 (T) noon
Video Lessons
41. Repeated PD with a Definite Time Horizon
42. Time Preference and Present Value
43. Discount Factors and Discount Rate
44. Present Value Example

Unit 13: Infinitely Repeated PD Quizzes close May 31 (Th) noon
Video Lessons
45. Grim Trigger
46. Using Geometric Sums to Find NE
47. Mutual Grim Trigger as NE?
48. Asymmetric Pay-offs

Workshop #7 May 31 (Th) 2pm.
Homework #6 due Jun 5 (T) noon. Peer Review due Jun 7 (Th) noon.

Unit 14: Cooperation in the Repeated PD Quizzes close Jun 5 (T) noon
Video Lessons
49. Repeated PD: General Form
50. Multiple Equilibria in the Repeated PD
51. What Do We Learn from the Repeated PD?

Final Workshop #8 Jun 7 2pm.

FINAL EXAM: JUN 13 (W)
8:00-11:00am
Covers Units 1-14
Poli Sci 30  
COURSE SCHEDULE BY WEEK  
SPRING 2018

<table>
<thead>
<tr>
<th>Week</th>
<th>Tuesday</th>
<th>Thursday</th>
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<tbody>
<tr>
<td>1</td>
<td>April 3</td>
<td>Noon. Unit 1 closes.</td>
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<tr>
<td>Online</td>
<td>Noon. Unit 2 closes.</td>
<td>No Workshop or Discussion Section Week 1</td>
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<tr>
<td>In person</td>
<td>2pm. Introductory Meeting.</td>
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<tr>
<td>2</td>
<td>April 10</td>
<td>Noon. Unit 3 closes.</td>
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<tr>
<td>Online</td>
<td>Noon. HW1 due. Unit 4 closes.</td>
<td>Noon. Peer Review of HW1 due. Unit 5 closes.</td>
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<tr>
<td>In person</td>
<td>2pm. Workshop #1.</td>
<td>2pm. Workshop #2.</td>
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<td>3</td>
<td>April 17</td>
<td>Noon. HW2 due. Unit 6 closes.</td>
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<tr>
<td>In person</td>
<td>2pm. Workshop #3.</td>
<td>2pm. Workshop #3.</td>
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<tr>
<td>4</td>
<td>May 1</td>
<td>Noon. HW1 due. Unit 8 closes.</td>
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<td>In person</td>
<td>2pm MIDTERM #1</td>
<td>2pm. Workshop #4.</td>
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<td>5</td>
<td>May 8</td>
<td>Noon. HW3 due. Unit 9 closes.</td>
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<td>In person</td>
<td>2pm. Workshop #5</td>
<td>2pm. Workshop #5.</td>
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<td>6</td>
<td>May 15</td>
<td>Noon. HW4 due.</td>
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<td>In person</td>
<td>2pm. Workshop #6</td>
<td>2pm. Workshop #6.</td>
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<tr>
<td>7</td>
<td>May 22</td>
<td>Noon. HW5 due.</td>
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<td>In person</td>
<td>2pm MIDTERM #2</td>
<td>2pm. MIDTERM #2.</td>
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<td>8</td>
<td>May 29</td>
<td>Noon. Unit 12 closes.</td>
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<tr>
<td>In person</td>
<td>2pm. Workshop #7</td>
<td>2pm. Workshop #7.</td>
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<tr>
<td>9</td>
<td>June 5</td>
<td>Noon. HW6 due.</td>
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<tr>
<td>In person</td>
<td>2pm. Workshop #8</td>
<td>2pm. Workshop #8.</td>
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<tr>
<td>FINALS</td>
<td>Wednesday, June 13</td>
<td>FINAL EXAM 8-11am</td>
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*Preliminary version 3/15/18*