GVPT 390 – FALL 2017

GAME THEORY

Professor Piotr Swistak, Department of Government and Politics and the Applied Mathematics, Statistics and Scientific Computation Program, office TYD 1140 G, tel. 405-4149, email: pswistak@umd.edu

Office hours: Tuesdays and Thursdays 12:00pm—1:00pm, TYD 1140 G or send me an email and we will meet at any time that is convenient for you.

Lectures: TYD 0101, Tuesdays 2:00pm - 4:45pm.

Teaching Assistants: Matthew Brundin, Benjamin Reichard and Matthew Rogers will be our TAs. They will hold their office hours on Mondays: Matthew Brundin 5:30pm-6:30pm (TBA), Benjamin Reichard 4:00pm-5:00pm (TBA) and Matthew Rogers 6:30pm-7:30pm (TBA). You can contact them at mbrundin@umd.edu, breichar@umd.edu and mdr18@umd.edu . They will start holding office hours on Monday, September 11.

IMPORTANT: THIS DOCUMENT MAY BE UPDATED THROUGHOUT THE SEMESTER. PLEASE CONSULT FREQUENTLY.

Three important points to keep in mind: (1) this class in **UNLIKE ANY OTHER POLITICAL SCIENCE** classes you might have taken, (2) game theory is a branch of **MATHEMATICS** (please see "A Beautiful Mind" movie; it is about game theory, in a sense), (3) I tend to explain things in my own way rather than follow a textbook, hence **ATTENDING** classes (from what students tell me) is very useful if not necessary.

This is an introductory course in game theory, a field of applied mathematics. Game theory is a general theory of behavior and, as such, it is a part of social science. While game theory has been used in the social sciences since 1940s, its impact of the last three decades has been extraordinary and unprecedented. My objective is to provide a comprehensive introduction to modern game theory. We will cover theory of preferences, expected utility theory, and a variety of solutions concepts including iterated dominance, Nash equilibria, subgame perfect equilibria, evolutionary equilibria and others. Please keep in mind that the material is mathematical and students who are not comfortable with basic algebra, or are averse to mathematics, may find this class prohibitive and, most certainly, not to their liking. (I have had semesters where the set of students enrolled in this class at the end of the semester was half of what it was at the beginning.)

All materials for this class (e.g., syllabus, lecture notes, homework assignments, etc) will be posted on ELMS

READINGS Books:

> Avinash Dixit, Susan Skeath and David Reiley, *Games of Strategy (4th edition)*, Norton, 2015. (required)
>
> Joel Watson, *Strategy (3rd edition)*, Norton, 2008 (excerpts from the 1st edition on ELMS)
>
> Robert Axelrod, *The Evolution of Cooperation*, Basic Books, 2006. (excerpts on ELMS.)

Other readings: David Kreps, *Notes on the Theory of Choice*, Westview Press, 1988; David Kreps, *A Course in Microeconomic Theory*, Princeton University Press, 1990; Raymond Wilder "The Axiomatic Method," pages 1621-1640 in *The World of Mathematics*, Simon and Schuster, 1956; Kenneth Williams, *Game Theory a Behavioral Approach,* Oxford University Press, 2013; and papers by Bendor and Swistak are on ELMS.

SELECTED READINGS ON ELMS

Since publishers allow access to about 25% of copyrighted materials I took the liberty of scanning some of the required readings and posting them on ELMS. My selection is arbitrary and includes what I thought may be the most difficult parts of the material. These excerpts do not and cannot substitute for the entire assigned reading.

WARNING

Material in this class is mathematical—**students are assumed to know basic mathematics/simple algebra at the high school level.**

MANDATORY GRADING

TESTS (50%):   There will be four mandatory tests. You are allowed to have a single page crib sheet for each test and exam. You cannot, however, use textbooks or any other notes. Calculators are allowed. The average of the four test grades will count as 50% of your class grade.

HOMEWORKS (35%): There will be seven homeworks. I will grade them for correctness but points will also be subtracted for incomplete or sloppy explanations. I will post homework solutions on the web, so late submissions will not be accepted and a missing homework will count as 0 towards your homework average. The average of your homework grades (all homeworks carry the same weight) will count as 35% of your grade.

PARTICIPATION (15%):   Your attendance combined with class participation will count 15%.

DATES, DEADLINES AND COMMUNICATION: I will use ELMS/CANVAS email system to inform you about posted files, homework deadlines, upcoming tests, etc. Please make sure that your email address as listed with ELMS is current and working.

EXTRA CREDIT

One notorious problem that leaves everyone upset are borderline grades. 89%, for instance, is a B+ while 90% is an A-. This feels unreasonable, to say the least, and in my opinion it is both unreasonable and unfair. To solve this problem we will use two tie-breaking tools: extra credit points for in-class competitions and the final exam.

CLASS PERFORMANCE—THE EXTRA CREDIT POINTS: Class performance, measured by in-class competitions, will count as follows: All extra credit points you have accumulated, if any, will be classified into four categories. Students in the top category will get an extra 3%, second highest, 2%, third highest, 1%, and lowest, 0%. To get extra credit percentage points you will need to have an above average number of points.

FINAL EXAM (to be announced): An <u>optional</u> way to improve your grade is by taking the final exam.

Final exam will count for 50% of your <u>test grade</u>. For example, suppose you have taken all tests and your average test score is 86%. In that case if you decide not to take the final exam, your class grade will be calculated with the 86% test average counting as 50% of your class grade. If, however, you take the final exam and score 94% on it, your class grade will be calculated with $0.5*86\% + 0.5*94\% = 90\%$ counting as 50% of your class grade.

PERCENTAGE GRADES WILL TRANSLATE INTO LETTER GRADES as follows: A- for 90-92%, A for 93-96%, A+ for 97% up; and analogously for B (80's), C (70's) and D (60's).

OTHER ISSUES

CRIB SHEET: All testing is closed book but you ARE ALLOWED to have a **crib sheet**—a single standard size sheet of paper with whatever information you want to put on it (both sides.)

SPECIAL PROBLEMS AND SITUATIONS: If you have any situation, e.g., medical, that can affect your performance in class you should let me know immediately and no later than a week after it happens. I may be able to solve the problem but only if you tell me about it early enough.

MISSING A TEST will **not** be **allowed** except for extraordinary circumstances like medical emergencies, jury duty, etc, for which, as our university requires, you will have to supply relevant documents (from the physician, court, etc). You have to inform me about such emergencies immediately and **no later than a week after** the missed test. If you neglect to document your absence within a week, I will assign zero points to a missed test; there will be no appeals.

LECTURES VERSUS READINGS: A good part of the material will not be contained in the readings and will only be presented in class. For this reason you should not think about the readings as a substitute for what we do in class—consider them **supplementary**. Attending classes, for all I know from the past, seems necessary to do well in this course.

Please don't use **NOTE(NET)BOOKS/LAPTOPS, PHONES and other electronic devices** in class.

UNIVERSITY POLICIES

ACADEMIC INTEGRITY: The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.studenthonorcouncil.umd.edu/whatis.html.

MEDICAL EMERGENCIES: Campus Senate policy requires students who are absent due to illness/injury to furnish documentary support to the instructor. I require students to contact me by email or by phone prior to class time in which you indicate that you have an illness or an injury. You must provide written documentation verifying your illness/injury immediately upon your return to class. You will not be allowed to turn in missed assignments or make up quizzes, tests, papers, etc. if you have not provided this documentation. Documentation not presented to me in a timely manner will not be accepted. In addition, if it is found that you have falsified the documentation provided, I will refer you to the University's Student Conduct Office.

SCHEDULE OF READINGS, HOMEWORKS AND TESTS
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WEEK 1 (Aug. 29)

Introduction: Examples of Topics, Methods, and Solutions

Related readings: Raymond Wilder, pages 1621-1640 (on ELMS.)
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WEEK 2 (Sep. 5)   HWK 1 posted

Choice under Certainty: Theory of Preferences

Related readings: Dixit, Skeath and Reiley Chapter1 and Kreps, pages 7-11 (for those who like it short and mathematical) and Williams pages 47 and 49-50 (for those who want something less mathematical than Kreps.)
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WEEK 3 (Sep. 12)   HWK 1 due; HWK 2 posted

Choice under Uncertainty: Von Neumann-Morgenstern Expected Utility Theory and the Foundation of Game Theory

Related readings: pages 1-6 from D. Kreps' "A Course in Microeconomic Theory" or Williams pages 63-68 (for those who want something less mathematical than Kreps.)
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WEEK 4 (Sep. 19)   HWK 2 due

Game Theory: Primitive Terms, their Properties and Interpretations

Related readings: Dixit, Skeath and Reiley Chapter 2 (excerpts from a different edition are on ELMS.)
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WEEK 5 (Sep. 26)

Simultaneous-Move Games: Dominance Solvability and Nash Equilibria

Related readings: Dixit, Skeath and Reiley Chapter 4 (excerpts from a different edition are on ELMS.)
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WEEK 6 (Oct. 3)   Test 1 on HWKS 1 & 2; HWK 3 posted

Sequential Games and Rollback Equilibria

Related readings: Dixit, Skeath and Reiley Chapter 3 (excerpts from a different edition are on ELMS.)
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WEEK 7 (Oct. 10)   HWK 3 due; HWK 4 posted

Simultaneous-Move Games: Mixed Strategies

Related readings: Dixit, Skeath and Reiley Chapter 7 (Watson Chapters 14, 15 and 16 recommended).
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WEEK 8 (Oct. 17)   HWK 4 due

Mixed Strategies (cont.) and Sequential versus Simultaneous-Move Games and Subgame-Perfect Equilibria

Related readings: Dixit, Skeath and Reiley Chapter 7 and 8 (excerpts from a different edition are on ELMS) also Watson Chapter 22 is recommended.)

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WEEK 9 (Oct. 24)   Test 2 on HWKS 3&4;   HWK 5 posted

Repeated Games

Related readings: : Dixit, Skeath and Reiley Chapter 11 and Watson Chapter 22 and Axelrod Part I.
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WEEK 10 (Oct. 31)   HWK 5 due
Folk Theorem

Related readings: Axelrod Part I and readings from the previous week continued.
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WEEK 11 (Nov. 7)   HWK 6 posted

Evolutionary Games

Related readings: Dixit, Skeath and Reiley Chapter 13 and Axelrod Part II and III.
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WEEK 12 (Nov. 14)   HWK 6 due

The Evolutionarily Stable Strategies and the Evolution of Cooperation

Related readings: Bendor and Swistak (1997).
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WEEK 13 (Nov. 21)   <mark>Test 3 on HWKS 5&6; HWK 7 posted</mark>

The Evolution of Norms

Related readings: Bendor and Swistak (2001).
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WEEK 14 (Nov. 28)   <mark>HWK 7 due</mark>
                  ## The Evolution of Social Structure

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WEEK 15 (Dec. 5)   <mark>Test 4 on HWK 7</mark>

Tying up Loose Ends

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