**HONORS 401: Applications of Game Theory (3 credits)**

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*Topics Covered:*  Concepts of decision theory, utility theory and multi-person games. Cooperative and non-cooperative games, Nash equilibrium, zero and non-zero sum games, practical applications via case studies and classroom experiments

*Hours*: Class meets M 6:00-9:00pm in AH 322. Our office hours are posted in our departments, but other times are also possible. Contact either of us to set up a time.

*Text*: *Game Theory: A Nontechnical Introduction,* Morton D. Davis (Dover, 1997)

**Course Objectives:**

Upon completion of this course you should be able to:

1. Understand the concepts of decision theory and two-person games.
2. Understand utility theory and its application to a conflict problem.
3. Understand the construction of a payoff matrix and the methods to reduce the dimension of game theoretic problems.
4. Understand the Principle of Indifference, Fair Games, Game Symmetry and methods to solve symmetric games.
5. Understand the differences between strategic form and extensive form games and the application of mixed strategies.
6. Understand the Nash equilibrium and its derivation.
7. Understand complexity issues related to cooperative games.

## Schedule of Weekly Topics

# Week Topics

8/26 Ch. 1 Overview (*Game Theory,* pp. 3-10)

9/2 Labor Day Holiday

9/9 Refresher of probability & statistics

9/16 Ch. 2 2-Person 0-Sum Games—Equilibrium & Domination (11-23)

9/23 Ch. 3 Generalized 2-Person —Minimax Theorem (24-39)

9/30 —Mixed Strategies (40-56)

10/7 Ch. 4 Utility Theory —Utility Function (57-65)

10/14 —Constructing Utility Function (66-74)

10/21 Ch. 5 2-Person Non-0-Sum Game—Analysis (75-108)

10/28 —Prisoner’s Dilemma (108-130)

11/4 —Applications (130-162)

11/11 Ch. 6 n-Person Games —Von-Neumann Morgenstern (163-193)

11/18 —Aumann-Maschler (193-204)

11/25 —Shapley-Shubik & Arrow (204-228)

12/2 Review and Presentations

**Use of Time and Grading Policy:**

Class time will be divided into thirds. The first period will be a discussion of the game(s) assigned for homework. The second period will be discussion of the assigned reading from the text. The third period will be devoted to playing a new game and discussing potential applications of the concepts.

Homework will have three parts—creating your own game/application based on the previous week’s work, trying your hand at one or more of the games at the beginning of the chapter for this week, and studying the chapter material assigned for the week. You will bring a brief write-up (1 page or so) of your game and share/play/discuss it in small groups at the beginning of each class (e-mail a copy to both professors). The homework will be assessed based on the command that it demonstrates of the principles discussed in the previous class and based on the creativity that it demonstrates in applying those principles to real-world problems.

The final exercise for the course will be a project. You will design and analyze a new game which uses the principles of 2-person or n-person non-0-sum game theory. You will briefly present your game to the class on 12/2, and will present a formal written description and analysis of the game by 12/9. The project will be assessed based on how appropriately the formal model is applied to a real-world situation, the accuracy and completeness of the formal analysis of the game, and the clarity (organization, focus on main issues while including all relevant side issues, etc.) with which the game and its application are described.

Course performance will be assessed as follows:

(1) Homework (50%)

(2) Project & Presentation (30%)

(3) Class Participation (20%)

### Other Matters:

All assignments are due on the assigned date. Partial credit may be given for assignments that are less than one week late, unless other arrangements have been made in advance.  
  
Written reports are expected to be free of grammatical, spelling, and content errors.  They should be submitted in typewritten, standard formats (APA, MLA, URSI Style Sheets). You must familiarize yourself with the University’s [Academic Honesty Policy](http://www.mnsu.edu/supersite/administration/basic-stuff/policies.html#ah). We encourage you to draw on the ideas of others—but you must also identify when you do so (you gain “brownie points” for citing the work of others!). Plagiarism is a serious breach of academic behavior and will result in an F for the course.

We will help you in whatever manner humanly possible.  However, once the semester is over, there is not a great deal we can do.  If there is something that you don’t understand, are having problems with, or need help on, please get in touch with us as early as possible.

Every attempt will be made to accommodate qualified students with disabilities.  If you are a student with a documented disability, please contact us as early in the semester as possible to discuss the necessary accommodations, and/or contact the Disability Services Office at 507-389-2825 (V) or 1-800-627-3529 (MRS/TTY).

## [Bibliography](http://krypton.mnsu.edu/~tony/courses/273/Bibliography.html)

There are a number of interesting and useful books and articles that might help you dig deeper into the issues raised in this course. Here are some of our favorites:

Binmore, Ken.  2007.  *Game Theory:  A Very Short Introduction*.  NY:  Oxford University Press.

Binmore, Ken. 2007. *Playing for Real: A Text on Game Theory.* NY: Oxford University Press.

Dixit, Avinash K. & Nalebuff, Barry J.  2008.  *The Art of Strategy:  A Game Theorist’s Guide to Success in Business & Life*.  NY:  W.W. Norton.

Hamburger, Henry.  1979.  *Games as Models of Social Phenomena*.  San Francisco:  WH Freeman.

Kreps, David M.  1990.  *Game Theory and Economic Modeling*.  Oxford:  Clarendon Press.

McCain, Roger A. 2003. *Game Theory: A Nontechnical Introduction to the Analysis of Strategy* (Independence, KY: Cengage Pubs.)

Schelling, Thomas C. 2006. *Micromotives and Macrobehavior, Rev. Ed.* NY: W.W. Norton.

Ury, William.  1993.  *Getting Past No,* Rev. Ed.  NY:  Bantam Books.

Von Winterfeldt, Detlof & Edwards, Ward.  1986.  *Decision Analysis and Behavioral Research.*  Cambridge:  Cambridge University Press.           `

Wynn, Martin.  1985.  *Planning Games*.  London:  E & FN Spon.

Zey, Mary.  1992.  *Decision Making:  Alternatives to Rational Choice Models*.  Newbury Park:  Sage.