GNM 2358: Introduction to Game Theory
Fall 2007 Syllabus

Instructor: Dr. Vincent Cicirello   **Office:** K-140
E-mail: Please use WebCT e-mail   **Phone (office):** 609-626-3526

Office Hours: Mondays: 12:45-2:00pm
Wednesdays: 9:55-11:10am
Available other times by appointment
Or, feel free to drop-in any time I'm in my office (if I'm not on my way to a meeting or class, I'd be happy to talk to you).

Course Time and Location: Monday, Wednesday, Friday, 11:20am-12:35pm, (B125)

This course is a Q1. This course is a W2.

Course Description: This course will introduce the student to topics in Game Theory. Game Theory is a high level mathematical field that governs conflict resolution and decision making skills. This course is an interesting blend of deep mathematical theory and real-world practicality. Due to the rich applications associated with this field, this is a perfect course for Math, Science, Business, Economic, and Psychology majors. The students will be introduced to theoretical mathematical tools including matrices, vectors, and graph theory. In addition, students will be taught applications associated with Biology, Politics, and Computer Science. Topics for the course include Two-player Zero-Sum (as well as Non-Zero-Sum) games of perfect information, Pure and Mixed Strategies, Dominance, and Rationality.

Course Objectives: The objectives of this course include:
- Learning fundamental principles and theories of game theory, in particular developing quantitative skills related to elementary properties of matrices and vectors, basic probability, and introductory concepts from graph theory;
- Gaining knowledge of the terminology and methods of the field of game theory, as well as insight into the practical application of game theory to real-world problems in the students' individual disciplines and beyond; and
- Learning to apply course concepts to improve decision-making skills, and more generally problem-solving skills.

Prerequisites: No specific Stockton College course pre-requisites are required. Students, however, should have a solid grasp on high-school level algebra.

Required Textbooks: "Game Theory: A Non-Technical Introduction to the Analysis of Strategy" by Roger McCain.

Other Assigned Readings: There will very likely be additional assigned required readings, such as journal articles. More information on these will be available at the relevant time during the course.

Grading:

In-class problem solving	35%	
Homework	35%	
Exam 1	10%	
Exam 2	10%	
Class Participation	10%	

Grading Scale: 90+ is an A, 80+ is at least a B, 70+ is at least a C, 60+ is at least a D
The phrase "at least a [lettergrade]" allows for a curve if necessary. Depending on the final grade distribution, these grade boundaries may be adjusted, but no higher than stated above.

Important Dates: Here is a list of several dates that are important for this class (e.g., approximate exam dates):
1) **Exam Dates:** The following exam dates are **subject to change**, but they will be no earlier than the following. If they change, you will have at least one week's warning.
   a. **Exam 1:** Monday, October 22, normal class time
   b. **Exam 2:** Monday, December 10, 11:30am-2:00pm (**Special time due to extended exam schedule week**)
2) **Days this class will not meet:**
   a. Wednesday, November 7 (Preceptorial Advising Day)
   b. Friday, November 23 (Thanksgiving Holiday)
   c. Friday, December 7 (this class does not meet due to the extended exam schedule)

In-class problem solving: Many class sessions will involve some amount of in-class "problem solving". These will frequently involve small group activities. They will be graded partially through your performance on the exercises, and partially through your participation in the exercises themselves. Generally, 50% of your grade on these will come simply from working on them.

Homework: There will be several problem sets for homework related to the course topics. Additionally, there will be short writing assignments (remember, this is a W2).

Exam 1 and Exam 2: The exams are not cumulative. Exam 1 will test material covered up to the class prior to the exam. Exam 2 will test material covered after exam 1.

Class Participation: Class will often involve in class small group discussion as well as other in class activities. Thus, participation is an important component of the course.

Due Dates: Homework problem sets will have deadlines, generally the beginning of class. Late assignments will be penalized by 50% of the grade that would have been obtained if submitted on time, but will not be accepted if more than 1 week late. I strive to return assignments graded in a timely manner, and thus cannot accept lateness beyond 1 week since that would delay returning graded assignments to the class as a whole.

Academic Honesty: Please familiarize yourself with Stockton's policy on academic honesty. Violations will result in a minimum penalty of a grade of 0 for the assignment or test involved in the violation. The in-class exams are open book / open notes. You may also use a calculator during the exams. No communications devices (e.g., cell phones, pagers, PDAs, etc) can be used during exams.

Make-Up Exams: Make-up exams in general will not be given (i.e., if you miss an exam, you get a 0). The only exceptions to this rule are the following:
1) Documented medical excuse: provide a note on doctor's letterhead the first class you return after the missed exam
2) Other institutional excuses: There may arise situations related specifically to Stockton that prevent you from being able to attend an exam. In most such cases, you should be aware of the conflict beforehand. Thus, I must be notified of this conflict one week prior to the missed exam.
3) Other similar situations: similar documentation must be provided.

List of Topics to be Covered in the Course: The following list is ambitious. A few of the following topics we may not get to. This list is also not necessarily in the order we will cover topics.
1) **Introduction to game theory:** What is game theory? What are some of its foundations? Interdisciplinary nature of game theory. Diverse applications.
2) **Two-person zero-sum games:** A non-technical introduction. We'll likely "play" a few examples in small groups.
3) **Two-person non-zero-sum games:** A non-technical introduction. We'll likely "play" examples in small groups.
4) **Matrices:** What is a matrix? Introduction of basic properties and operations of matrices (e.g., cells, indices, addition, multiplication by a scalar).
5) **Vectors:** What is a vector? Introduction of basic properties and operations of vectors
6) **Normal Form Games:** Introduction to normal form games (or matrix games)
   a. Modeling a decision-making situation as a normal form (or matrix) game
   b. Strategies: what they are, etc
   c. Pure strategies
   d. Strictly dominated strategies
   e. Weakly dominated strategies
   f. Eliminating dominated strategies
7) **Elementary probability:** Introduction to basic concepts from probability
8) **Mixed Strategies**
9) **Rationality:** Discuss rationality. Specifically, notion that rational decision-making implies taking action that maximizes the expected utility of one's outcome. Discuss game theory's reliance on assumption of rational players.
10) **Equilibrium strategies**
11) **Elementary graph theory:** What is a graph? What are vertices and edges? What is a tree?
12) **Game trees and sequential move games**
13) **Games against nature**
14) **Applications:** Anthropology, Politics, Warfare, Philosophy, Computer Science, Biology, Business, etc
15) **Experimental Game Theory:** How well does game theory's predictions match human decision-making in experimental settings? We'll read and discuss a few articles on this topic.