

MATH420

STUDENT WARNING: This course syllabus is from a previous semester archive and serves only as a preparatory reference. Please use this syllabus as a reference only until the professor opens the classroom and you have access to the updated course syllabus. Please do NOT purchase any books or start any work based on this syllabus; this syllabus may NOT be the one that your individual instructor uses for a course that has not yet started. If you need to verify course textbooks, please refer to the online course description through your student portal. This syllabus is proprietary material of APUS.

Course Summary

Course : MATH420 **Title :** Game Theory and Decision Models

Length of Course : 8

Prerequisites : MATH410, MATH415 **Credit Hours :** 3

Description

Course Description: “A Beautiful Mind” is a movie that helped popularize game theory. It is a biographical film about the life of John Nash who is known for his work in game theory. “Game theory is the study of mathematical models of conflict and cooperation between intelligent and rational decision makers.” This course examines game theories and their applications commonly found in economics, business, political science, and law and how to model games to make informed decisions. Topics include dominance solutions, Nash equilibrium, backward induction, subgame perfect equilibrium, repeated games, dynamic games, Bayes-Nash equilibrium, mechanism design, auction theory, and signaling. (Prerequisites: MATH410 AND MATH415)

Course Scope:

The course is delivered online and is organized into distinct parts. The first part of the course covers the basic concepts involved in game theory and its depiction in strategic form. The second part of the course investigates the extensive form of game theory. The third and final part of the course concentrates on asymmetric games. Practical applications are provided throughout the course.

Objectives

After completing the course, the student should be able to accomplish these Course Objectives (CO):

- CO-1 Explain game theories and models used in business, industry, government and the military.
 - CO-2 Solve problems under certainty and uncertainty conditions.
 - CO-3 Analyze decision models using Microsoft Excel.
 - CO-4 Solve problems using decision models and strategies.
 - CO-5 Evaluate “what if” sensitivity results using decision models.
 - CO-6 Justify decision model results and analyses in writing and orally.
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Outline

Week 1: Introduction, A First Look at the Applications

Learning Objectives

CO-1

Reading And Study

Chapter 1

Assignment

Forums:

Introduce Yourself
A Guessing Game

Homework

pp. 12-15: 1, 2, 3, 8, 9, 13, 14, 15, 16, 23, 24

Week 2: Strategic Form Games and Dominant Strategies Dominance Solvability

Learning Objectives

CO-1

CO-2

Reading And Study

Chapters 3, 4

Assignment

Forum:

Defining Strategic Form Games

Homework

pp. 45-48: 8, 9, 10, 11, 12, 13, 14, 15, 22, 23, 24

pp. 59-62: 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22

Week 3: Nash Equilibrium Mixed Strategies

Learning Objectives

CO-1

CO-2

CO-4

Reading And Study

Chapters 5, 8

Assignment

Forum:

Expected Payoffs of Mixed Strategies

Homework

pp. 71-74: 4, 5, 6, 7, 8, 9, 18, 19, 20, 22

pp. 116-120: 5, 6, 7, 8, 16, 17, 18, 19

Test:

Strategic Form Games

Week 4: Extensive Form Games and Backwards Induction The Commons Problem

Learning Objectives

CO-1

CO-2

CO-4

Reading And Study

Chapters 7, 11

Assignment

Forums:

Extensive Form Games and Backward Induction

An Investment Game

Homework

pp. 175-177: 2, 4-7

Week 5: Subgame Perfect Equilibrium Infinitely Repeated Games

Learning Objectives

CO-1

CO-2

CO-4

Reading And Study

Chapters 13, 15

Assignment

Forums:

Infinitely Repeated Games and the Grim Trigger

Midterm Reflection

Homework

pp. 205-208: 1-6, 21-23

pp. 238-241: 1-5, 9-12

Test:

Extensive Form Games

Week 6: Moral Hazard and Incentive Theory Games with Incomplete Information

Learning Objectives

CO-1
CO-2
CO-4

Research Paper
CO-1
CO-6

Reading And Study

Chapters 19, 20

Assignment

Forum:
Moral Hazard

Homework
pp. 306-308: 1-4
pp. 326-330: 5-8, 19-23

Assignment:
Research Paper Due

Week 7: Mechanism Design, the Revelation Principle, and Sales to an Unknown Buyer An Application: Auctions Signaling Games and the Lemon Problem

Learning Objectives

CO-1
CO-2
CO-4

Reading And Study

Chapters 22, 23, 24

Assignment

Forums:
Signaling
An Auction Game

Homework
pp. 362-365: 21-23
pp. 378-382: 1-3
pp. 396-400: 14-19

Test:
Asymmetric Information Games

Week 8: Course Review Final Examination

Learning Objectives

CO 1–6

Excel Project
CO-2
CO-3
CO-5

Reading And Study

Chapters 1, 3, 4, 5, 8, 11, 13, 15, 19, 20, 22, 23, 24

Assignment

Forum:

Final Debriefing and Farewell

Assignment: Excel Project Due

Final Exam

Evaluation

Forum Assignments: The University requires weekly contact from each student. This requirement can be met by taking the Unit Tests and by participating in the Forums. A total of 10% of the final grade will be based on participation in the weekly Forums. Forum postings are expected to be written in complete sentences using correct grammar and spelling unless otherwise directed. Any posting which requires research must be accompanied by a citation of the references used.

Homework: Homework problems are assigned for each section of the book that we study. Unlike many lower-level courses, the homework here is a guide to help you focus your study efforts. Although they may not directly impact your grade, they are still an important factor in your success at mastering the subject. Math is not a spectator sport - one learns math by putting the pencil to the paper!

Research Paper: During this course, you will be asked to research an application related to the theory contained in this course and prepare a formal analysis of the subject. This is a formal paper, and is expected to be produced in either MLA or APA format, to include proper documentation of outside sources. This assignment will account for 10% of the final grade.

Excel Project: During this course, we will study several topics that involve calculations that will become repetitive in nature. In this project, you will use Excel to assist in these computations.

Tests: There will be a graded test at the end of each part of the course. Each will be a timed, open-book, open-note exam. You may not consult with any other person while taking the exam. A total of 45% of the final course grade comes from these three tests.

Final Exam: The final exam will count as 30% of the final grade. It will also be an open-book, open-note exam. You may not consult with any other person while taking the exam. This examination will be based on all material covered during the semester. Please coordinate with the professor for any special arrangements. Unless the professor approves alternate arrangements, students should plan to take the final examination during the last week of the course. You will **not** need a proctor to take this exam.

Grading:

Name	Grade %
Honor Code	1.00 %
APUS Honor Code and Pledge	1.00 %
Forums	10.00 %
W1: Introduction	1.00 %

W1: A Guessing Game	0.33 %
W2: Defining Strategic Form Games	1.00 %
W3: Expected Payoffs of Mixed Strategies	1.00 %
W3: An Investment Game	0.33 %
W4: Extensive Form Games and Backward Induction	1.00 %
W5: Midterm Reflection	1.00 %
W5: Infinitely Repeated Games and the Grim Trigger	1.00 %
W6: Moral Hazard	1.00 %
W7: Signaling	1.00 %
W7: Auction Game	0.33 %
W8: Final Debriefing	1.00 %
Projects	15.00 %
W6: Research Paper	10.00 %
W8: Excel Assignment	5.00 %
Tests	45.00 %
Test 1: Strategic Form Games	15.00 %
Test 2: Extensive Form Games	15.00 %
Test 3: Asymmetric Information Games	15.00 %
Final Examination	30.00 %
Final: Game Theory and Design v2	30.00 %

Materials

Book Title: Strategies and Games: Theory and Practice-E-book is available in the APUS Online Library

Author: Prajit K. Dutta

Publication Info: Library of Congress

ISBN: 9780262041690

Book Title: To find the library e-book(s) req'd for your course, please visit <http://apus.libguides.com/er.php> to locate the eReserve by course #. You must be logged in to eCampus first to access the links.

Author: N/A

Publication Info: N/A

ISBN: N/A

Please visit <http://apus.libguides.com/Mathematics> and search for additional resources for this course.

Course Guidelines

Citation and Reference Style

- Attention Please: Students will follow the APA Format as the sole citation and reference style used in written work submitted as part of coursework to the University. Assignments completed in a narrative essay or composition format must follow the citation style cited in the APA Format.

Tutoring

- [Tutor.com](https://www.tutor.com) offers online homework help and learning resources by connecting students to certified tutors for one-on-one help. AMU and APU students are eligible for 10 free hours* of tutoring provided by APUS. Tutors are available 24/7 unless otherwise noted. Tutor.com also has a SkillCenter Resource Library offering educational resources, worksheets, videos, websites and career help. Accessing these resources does not count against tutoring hours and is also available 24/7. Please visit the APUS Library and search for 'Tutor' to create an account.

Late Assignments

- Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. The due date for each assignment is listed under each Assignment.
- Generally speaking, late work may result in a deduction up to 15% of the grade for each day late, not to exceed 5 days.
- As a working adult I know your time is limited and often out of your control. Faculty may be more flexible if they know ahead of time of any potential late assignments.

Turn It In

- Faculty may require assignments be submitted to Turnitin.com. Turnitin.com will analyze a paper and report instances of potential plagiarism for the student to edit before submitting it for a grade. In some cases professors may require students to use Turnitin.com. This is automatically processed through the Assignments area of the course.

Academic Dishonesty

- Academic Dishonesty incorporates more than plagiarism, which is using the work of others without citation. Academic dishonesty includes any use of content purchased or retrieved from web services such as CourseHero.com. Additionally, allowing your work to be placed on such web services is academic dishonesty, as it is enabling the dishonesty of others. The copy and pasting of content from any web page, without citation as a direct quote, is academic dishonesty. When in doubt, do not copy/paste, and always cite.

Submission Guidelines

- Some assignments may have very specific requirements for formatting (such as font, margins, etc) and submission file type (such as .docx, .pdf, etc) See the assignment instructions for details. In general, standard file types such as those associated with Microsoft Office are preferred, unless otherwise specified.

Disclaimer Statement

- Course content may vary from the outline to meet the needs of this particular group.

Communicating on the Forum

- Forums are the heart of the interaction in this course. The more engaged and lively the exchanges, the more interesting and fun the course will be. Only substantive comments will receive credit. Although there is a final posting time after which the instructor will grade comments, it is not sufficient to wait until the last day to contribute your comments/questions on the forum. The purpose of the forums is to actively participate in an on-going discussion about the assigned content.
- “Substantive” means comments that contribute something new and hopefully important to the discussion. Thus a message that simply says “I agree” is not substantive. A substantive comment

contributes a new idea or perspective, a good follow-up question to a point made, offers a response to a question, provides an example or illustration of a key point, points out an inconsistency in an argument, etc.

- As a class, if we run into conflicting view points, we must respect each individual's own opinion. Hateful and hurtful comments towards other individuals, students, groups, peoples, and/or societies will not be tolerated.
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University Policies

[Student Handbook](#)

- [Drop/Withdrawal policy](#)
- [Extension Requests](#)
- [Academic Probation](#)
- [Appeals](#)
- [Disability Accommodations](#)

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