BOSTON COLLEGE
Economics Department

ECON 3308-01
GAME THEORY IN ECONOMICS

Fall 2024

COURSE MEETING TIME: M – W 4:30 – 5:45 PM, O'Neill Library 257

INSTRUCTOR: Michele Biavati

Office: Maloney Hall 382

Email: michele.biavati@bc.edu

OFFICE HOURS: - in person, Tuesday, 10:30 – 11:30 AM and 2:30 – 3:30 PM
- by appointment (in person or on Zoom).

TEACHING ASSISTANT: Francesco Bressi, bressif@bc.edu

COURSE AIMS AND METHODS:

This course is about game theory and strategic thinking. Ideas such as dominance, backward induction, Nash equilibrium, sub-game Nash equilibrium, Bayesian and perfect Bayesian Nash equilibria, evolutionary stability, commitment, credibility, asymmetric information, adverse selection, and signaling are discussed and applied to games played in class, and examples drawn from economics, politics, sports, and elsewhere.

One aim of the course is to teach students some strategic considerations to take into account when making choices. A second aim is to predict how other people or organizations behave when they are in strategic settings. We will see that these aims are closely related. We will learn new concepts, methods, and terminology. A third aim is to apply these tools to settings from economics and other disciplines. The course will emphasize examples.

By the end of the course, students will gain a strong mathematic background in Game Theory and will be able to:

- understand a wide variety of models such as voting, signaling, and imperfect competition
- apply in different scenarios the models learned in class
- interpret and analyze different outcomes of strategic interactions
- evaluate the equilibrium implication of information and players' rationality

TEXTBOOKS AND RESOURCES

- J. Watson: *Strategy: An Introduction to Game Theory*, 3rd edition Norton 2013 (Introductory Textbook – *Recommended*)
- Gibbons, Robert. *Game Theory for Applied Economists*. Princeton, NJ: Princeton University Press, 1992 (Intermediate Textbook – *Suggested*)
- A. Dixit & B. Nalebuff: *The Art of Strategy: A Game Theorist's Guide to Success in Business and Life*, W.W. Norton & Company 2008 (Examples – *Optional*: a less technical introduction to the ideas, concepts and examples that will be covered in this cours

You can obtain older or newer editions. In this case, you are responsible for finding the material covered in class.

CLASS POLICIES

- During class, the use of electronic devices is not allowed except for the use of notebooks solely intended for taking notes.
- Class attendance is strongly recommended since the exams will be based on material covered in class and homework assignments. This is an in-person class. To promote active participation, no Zoom streaming or class recordings will be provided. If you happen to miss a class, it is your responsibility to acquire class notes and review the material covered. During regular office hours, I will be available to discuss any questions about the class content.
- Material for lectures, assignments, and important announcements will be posted on the Canvas website; it is your responsibility to enable notifications and visit it frequently.
- Students are encouraged to ask questions and express their opinions. They should be expressed (and received) respectfully.
- Please do not email me if you are missing class. There is no need to seek my approval for any absences.
- The Boston College's academic integrity policy applies to all work in this class. Violations include but are not limited to cheating on exams, having unauthorized possession of an exam or problem set solutions, and submitting another person's work as your own. When in doubt about what constitutes academic dishonesty, please ask! Ignorance of this policy is not an acceptable excuse for noncompliance. Academic dishonesty is a serious offense against the

college. Sanctions for academic dishonesty are assigned by a Committee on Academic Integrity and may include failure on the assignment, failure in the course, or suspension or expulsion from the College for multiple academic dishonesty findings.

- **If you have any questions, please ask!**

STUDENTS WITH DISABILITIES

I am committed to supporting the learning of all students in my class. If you have a learning disability, you are strongly encouraged to request accommodations for this course. Exams are lengthy and have some time pressure. Please register with either the Connors Family Learning Center (learning disabilities and ADHD) or Disabilities Services (all other disabilities). Advance notice and appropriate documentation are required for accommodations.

STATEMENT OF INCLUSION

It is my intent that students from all diverse backgrounds and perspectives are well-served by this course and that students' learning needs be addressed both in and out of class. I view the diversity that students bring to this class as a resource, a strength, and a benefit. I intend to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socio-economic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know of ways to improve the effectiveness of the course for you personally or for other students or groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that I can make arrangements for you.

GRADING

The final grade will be determined by the scores in the exams as follows:

Problem Sets 10%

First Midterm 25%

Second Midterm 25%

Final Exam 40%

Extra credits will NOT be available in this class.

Problem sets and exams will cover material presented in class and previous problem sets.

- Re-grading: I do not discuss grades or grading policies with students directly. If you believe there has been an error in grading, you may submit a formal, written request for re-evaluation. Please note that, except in cases where points were added incorrectly, any re-evaluated work will be reviewed in its entirety, which may result in the grade being raised, lowered, or remaining the same. Once the final grade has been awarded for the course, any requests for re-grading will need to be directed to the University's grading review process.

- Problem Sets: Problem sets will be assigned via Canvas every other week. each graded on a scale of 0 to 3. Submissions with serious flaws but showing sincere effort will earn one point. Submissions with some mistakes but showing basic understanding will earn two points. Near perfect submissions will earn three points. You may work in groups of up to four people; please submit only one set of answers per group and write all names on the top. Doing the assignments is essential for your understanding, and therefore, shortcuts are not recommended. Sometimes, problems will be assigned on material not yet covered in class or that extends the lecture material; it's all right if you make mistakes; you will learn a lot from them.

The following table will be used to convert the final numerical score on the course to letter grades.

% Score > 90	A+
% Score > 85 and ≤ 90	A
% Score > 80 and ≤ 85	A-
% Score > 75 and ≤ 80	B+
% Score > 70 and ≤ 75	B
% Score > 66 and ≤ 70	B-
% Score > 63 and ≤ 66	C+
% Score > 60 and ≤ 63	C
% Score > 55 and ≤ 60	C-
% Score ≥ 50 and ≤ 55	D
% Score < 50	F

EXAMS POLICIES

- **Exams are closed notes and closed books**: consulting notes, books, or class material during the exams is not allowed; using computers or cell phones during the exams will also not be permitted.

- Each exam will build on previous analytical tools and material. The final exam will be cumulative.

- **There will be no make-up dates for the midterms**. If you miss one of the midterms for a documented illness or emergency, your final exam score will receive the weight of the midterm you missed in addition to its own weight.

- This policy applies to one missed midterm only, so your second missed midterm will receive a grade of 0. Students who miss midterms usually fare worse in the course, so please use the missed mid-term policy judiciously. If you find the midterm times inconvenient, please drop this class.

- **There will be no make-up dates for the final exam**. In case you miss the final exam for a documented illness or emergency, you will receive an Incomplete grade in the course, and you will take the final exam in the first week of the following semester.

- Early exams are only given to students who will miss the announced exam day due to students participating in official university-sponsored events, including athletics competitions. The student is responsible for contacting the instructor at least one week before the exam and making arrangements to take the exam in advance. The previous policy will apply to students who fail to make advance arrangements.

The **first midterm exam** will be held in class on **Monday, 7 of October 2024**

The **second midterm exam** will be held in class on **Monday, 25 of November 2024**

The **final exam** will be held on **Wednesday, 11 of December 2024, 4:00 – 6:30 PM**

OUTLINE AND READING:

The readings are recommended, and you'll benefit most from reading the chapters before classes.

Simultaneous Games of Complete Information

Part I (Gibbons: 1.1, 1.1.A, Watson: 1, 3, 5)

1.1 Introduction

1.2 Prisoner's Dilemma

1.3 Coordination

1.4 Ingredients of Strategic Form Games

Part II (Gibbons: 1.1.B, 1.1.C – Watson: 6, 7, 8)

2.1 Dominance & Iterative Deletion

2.2 *Applications*: Dominance & Iterative Deletion

2.3 Median-Voter Theorem

2.4 Best Response and Rationalizability

2.5 *Applications*: Best Responses in Business, Partnerships

Part III (Gibbons: 1.1.C, 1.2.A, 1.2.B – Watson: 9, 10)

3.1 Introduction to Nash Equilibrium

3.2 *Application*: Dating, Imperfect Competition, Linear-city model, Location Game

Part IV (Gibbons: 1.3.A - Watson: 11, 12)

4.1 Mixed Strategies

4.2 *Applications*: Tennis, Baseball, Dating, Paying Taxes

FIRST MIDTERM

Sequential Games of Complete Information

Part V (Gibbons: 2 – Watson: 2, 4, 14, 15)

5.1 Sequential Games

5.2 *Applications*: Moral Hazard, Incentives, Hungry Lions

Part VI (Gibbons: 2.1.A, 2.1.B, 2.2.D – Watson: 16, 18, 19, 21)

6.1 Backward Induction

6.2 *Applications*: Commitment, Spies, First-Mover Advantages, Credible Threats and Reputation

6.3 *Applications continued*: Ultimatums, Bargaining

Sequential Games of Complete but Imperfect Information

Part VII (Gibbons: 2.2, 2.2.A, 2.4, 2.4.A, 2.2.B – Watson: 15, 16)

7.1 Games of Imperfect Information

7.2 Information sets

7.3 Sub-game Perfection

7.4 *Applications*: Matchmaking, War of Attrition

Repeated Games of Complete Information

Part VIII (Gibbons: 2.3, 2.3.A, 2.3.B – Watson: 22, 23)

8.1 *Applications*: Cooperation vs. the End Game in Prisoners' Dilemma

8.2 Applications: Cheating and Punishment, Outsourcing

SECOND MIDTERM

Games of Incomplete (Asymmetric) Information

Part IX (Gibbons 4.1, 4.2, 4.2.A, 4.2.B, 3.2.B – Watson: 28, 29, 27)

9.1 *Applications*: Signaling and Screening, Education

9.2 *Applications*: Auctions

[Time Permitting] **EVOLUTIONARY GAME THEORY**

Part X
(Martin J. Osborne: "An Introduction to Game Theory" Chapter 13 (13.1 and 13.2))

10.1 Evolutionary Stability

10.2 Cooperation, Mutation, and Equilibrium

10.3 Social Convention, Aggression, and Cycles

Disclaimer: The instructor reserves the right to alter the syllabus or the schedule during the semester as needed. Any deviations will be announced, and a revised syllabus will be made available.