University of Notre Dame
Department of Economics

Kali Rath   **Econ 40050.02:   Course Outline**   Fall 2024

Course Objective: The objective of this course is to help you develop a good understanding of the basic concepts in game theory and learn how to apply these concepts to better understand strategic interactions. Important topics covered in this course will include: normal form games, extensive form games, Nash equilibrium, subgame perfect Nash equilibrium, repeated games, the folk theorem for repeated games, bargaining, strategic voting and games of incomplete information. We shall also use different examples to illustrate how these concepts and analytical tools can be useful in understanding strategic behavior in economic, political and social interactions.

Text: Joseph E. HARRINGTON: *Games, Strategies, and Decision Making*, Second Edition, Worth Publishers, 2015 (Recommended).

Course Requirements: The requirements for this course are:

Problem Sets (Three out of Four)	24%
Paper	8%
Midterm Exams (Two)	34%
Final Exam	34%
Total	100%

There will be *four* homework assignments during the semester, out of which the best *three* will count for the final grade. Students can work in groups for homework, but each student must submit her/his own work. Students can form groups to work on the paper. There will be *two* midterm exams and *one* final for the course. The final exam will be comprehensive. Students must take all the exams at the scheduled times.

Honor Code: The Notre Dame Academic Code of Honor Pledge (available at: http://honorcode.nd.edu/) is observed in this course. Notre Dame students are expected to abide by Academic Code of Honor Pledge. "As a member of the Notre Dame community, I acknowledge that it is my responsibility to learn and abide by principles of intellectual honesty and academic integrity, and therefore I will not participate in or tolerate academic dishonesty."

Miscellany: My *Office Hours* will be on Tuesdays and Thursdays between 2:00–3:00 PM and by appointment in *3076 Jenkins Nanovic Hall*. You are strongly encouraged to discuss with me questions you may have regarding the course material. My office phone is *(574) 631 7590* and email address is *rath.1@nd.edu*.

Time Table:

Month	Date	Day	Topic	Others	No.
Aug	27	Tue	Chs. 01, 02	Introduction	29
	29	Thu	Chs. 01, 02	Introduction	28
Sep	03	Tue	Ch. 03		27
	05	Thu	Ch. 04		26
	10	Tue	Chs. 04, 05	*HW 1 Assigned*	25
	12	Thu	Ch. 06		24
	17	Tue	Ch. 07		23
	19	Thu	Ch. 07	*HW 1 Due*	22
	24	Tue	Ch. 08	*HW 2 Assigned*	21
	26	Thu	Chs. 08, 09		20
Oct	01	Tue	Chs. 08, 09		19
	03	Thu	Chs. 13, 14	*HW 2 Due*	18
	08	Tue	Chs. 14, 15		17
	10	Thu		*Midterm 1*	16
	15	Tue	Chs. 14, 15		15
	17	Thu	Bargaining		14
	22	Tue		*Mid−semester Break*	
	24	Thu		*Mid−semester Break*	
	29	Tue	Bargaining	*HW 3 Assigned*	13
	31	Thu	Voting		12
Nov	05	Tue	Voting		11
	07	Thu	Ch. 10	*HW 3 Due*	10
	12	Tue	Ch. 10		09
	14	Thu		*Midterm 2*	08
	19	Tue	Ch. 10		07
	21	Thu	Ch. 10	*HW 4 Assigned*	06
	26	Tue	Ch. 11		05
	28	Thu		*Thanksgiving*	
Dec	03	Tue	Ch. 11		04
	05	Thu	Ch. 11	*HW 4 Due*	03
	10	Tue	Ch. 11	*Paper is Due*	02
	12	Thu	Review		01
	16	Mon	10:30 AM	*Final*	

Important Concepts:

<u>Ch. 01</u>: Strategic reasoning, Strategic interdependence, Preferences, Beliefs.

<u>Ch. 02</u>: Extensive form games of perfect and imperfect information, The notion of strategy, Strategic form games, Moving from extensive form to strategic form and vice versa, Common knowledge.

<u>Ch. 03</u>: Dominant strategy, Strong and weak dominance, Solving a game when rationality is common knowledge, Iterative deletion of strictly dominated strategies.

<u>Chs. 04 & 05</u>: Simultaneous move games, Normal/Strategic form, Payoff matrix, Nash equilibrium, Properties of Nash equilibria, Symmetric games.

<u>Ch. 06</u>: Optimization in continuous variables, Reaction or best response functions, Price and quantity competition, Tragedy of the commons.

<u>Ch. 07</u>: Choice under uncertainty, Expected value, Expected utility and payoffs, Mixed strategies, Mixed strategy Nash equilibrium, Properties of mixed strategy Nash equilibria.

<u>Ch. 08</u>: Sequential move games, Game tree, Extensive form, Decision nodes, Nash equilibrium, Backward induction, Subgame perfect Nash equilibrium, Off–equilibrium paths, Stackelberg leadership.

<u>Ch. 09</u>: Sequential games of imperfect Information, Information sets, Subgame perfect Nash equilibrium, Moving between extensive and strategic form games.

<u>Ch. 10</u>: Games with private information, Bayesian games and Bayes–Nash equilibrium, Auctions and bidding, Common value and winner's curse.

<u>Ch. 11</u>: Signaling games, Perfect Bayes–Nash equilibrium, Separating and pooling equilibria, Job market signalling, Market for lemons, Adverse selection, Moral hazard, Incentive compatibility.

<u>Chs. 13, 14 & 15</u>: Finitely repeated games, Infinitely repeated games, Subgame perfection, Cooperation and Collusion, Discounting, Folk theorem, Punishment strategies, Grim–trigger strategies, Applications.

(Extra Topic) Bargaining: The Nash bargaining problem, Utilities possibility set, Disagreement outcome, Axioms on the solution and the solution, Applications of the Nash bargaining solution.

(Extra Topic) Topics in Voting: The Condorcet paradox, Arrow's impossibility theorem, Borda count, Manipulation of voting schemes.

Guidelines for Answering Problem Sets and Exams:

1. Write clearly and legibly. (If necessary double space lines while writing.)

2. Always label the axes in graphs.

3. Any mathematical derivation should contain all the steps.

4. Explanation counts most, especially in True/False questions.

5. If several explanations are available, for example (A) Verbal or Intuitive, (B) Geometric (with the aid of Graphs) and (C) Mathematical; then give *at least two*. Preferably the geometric one and one of verbal and mathematical.

Important Dates:

	Date	Day	Event	Coverage
1.	Sep 10	Tue	HW 1 Assigned	
2.	Sep 19	Thu	HW 1 Due	
3.	Sep 24	Tue	HW 2 Assigned	
4.	Oct 03	Thu	HW 2 Due	
5.	Oct 10	Thu	*Midterm 1*	Chs. 01−09.
6.	Oct 29	Tue	HW 3 Assigned	
7.	Nov 07	Thu	HW 3 Due	
8.	Nov 14	Thu	*Midterm 2*	Chs. 13−15, Bargaining, Voting.
9.	Nov 21	Thu	HW 4 Assigned	
10.	Dec 05	Thu	HW 4 Due	
11.	Dec 10	Tue	*Paper is Due*	
12.	Dec 16	Mon	*Final*	Chs. 03−06, Chs. 08−11, Chs. 13−15,
	10:30 AM			Bargaining, Voting.