**Course Title:** Game Theory

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| **Course Code:** UEO 301 | **No of credits:** 4 | **L-T-P:** 44-16-0 | **Learning Hours:** 60 |

**Pre-requisite course code and Title:** Intermediate Microeconomic theory I (UEO 203) and Intermediate Microeconomic theory II (UEO 202)

**Department:** Department of Policy and Management Studies

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| **Course Coordinator:** Dr. Aditi Singhal | **Course Instructor:** Dr. Aditi Singhal |

**Contact Details:** aditi.singhal@terisas.ac.in

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| **Course Type:** Core | **Course offered in:** Semester 5 |

**Course Description:** This course introduces students to the theoretical foundations and applied aspects of non-cooperative game theory. Students will learn to model, analyze, and interpret strategic behavior in both complete and incomplete information environments. The course emphasizes precision in formulation, depth in conceptual understanding, and advanced equilibrium analysis, preparing students for advanced research in microeconomics, public policy, and related disciplines.

**Course Objective:**

1. Gain fluency in mathematical modeling of strategic situations.
2. Analyze static and dynamic games under various informational settings.
3. Apply equilibrium concepts to interpret institutional outcomes and agent behavior.
4. Understand the foundational principles of mechanism design and information economics.
5. Engage critically with academic literature and advanced problem sets.

**Course Contents:**

| Module | Topics | L | T | P |
|---|---|---|---|---|
| 1 | - Fundamentals of Game Theory<br>Mathematical preliminaries, formal definition of games, strategic vs. extensive form, preferences and utility functions, information partitions. | 3 | 2 | |
| 2 | - Static Games of Complete Information<br>Strict and weak dominance, best response functions, Nash equilibrium: existence characterization, and applications in oligopoly, voting, and public goods. | 3 | 2 | |
| 3 | - Mixed Strategy Equilibria and Refinements<br>Randomization, payoff equivalence, expected utility, mixed-strategy Nash equilibrium, strategic uncertainty, and equilibrium refinements (e.g., trembling-hand perfection). | 4 | 2 | |
| 4 | - Dynamic Games of Perfect Information<br>Extensive form with perfect recall, backward induction, subgames and credibility, applications in bargaining, entry deterrence, and strategic commitment. Application of Common property resource use. | 7 | 2 | |
| 5. | - Repeated Games and Long-run Interaction<br>Finitely and infinitely repeated games, subgame perfection in repeated settings, folk theorems, punishment strategies, and cooperation under enforcement constraints. | 12 | 4 | |
| 6 | - Static Games of Incomplete Information (Bayesian Games)<br>Harsanyi type spaces, belief systems, Bayesian Nash equilibrium, auctions, and strategic market interaction under private information (Cournot's Model), provision of public goods and adverse selection. Application of climate negotiations. | 15 | 4 | |
| | **Total** | **44** | **16** | |

**Evaluation Criteria:**

Minor 1: Written examination (Module 1, 2 and 3) – 25%
Minor 2: Written examination (Module 4 and 5) – 25%
Major: Written examination (Module 1 to 6) – 50%

**Learning Outcomes:**

At the end of the course the student must be able to:

1. Formulate normal form of a game, and able to solve for pure and mixed strategy equilibriums (Based on Minor 1)
2. Draw game tree and solve games of perfect and imperfect information using various solution concepts (Based on Minor 2)
3. To apply various game theoretic solution concepts to economic applications (Based on Minor1, Minor 2 and Major)

**Core Readings:**

1. Gibbons, R. (1992). *Game Theory for Applied Economists*. Princeton University Press.
2. Dutta, P. K. (1999). *Strategies and Games: Theory and Practice*. MIT Press.
3. Watson, J. (2002). *Strategy: an introduction to game theory*. Norton.

**Additional Readings:**

1. Osborne, M. J. (2004). *An introduction to game theory*. New York: Oxford university press.
2. Watson, J. (2002). *Strategy: an introduction to game theory*. Norton.
3. Fudenberg, D., & Tirole, J. (1991). *Game Theory*. MIT Press (selected chapters).

**Module wise chapters from the core readings**

Module 1: Gibbons Ch. 1; Dutta Ch. 1; Watson Ch.1
Module 2: Gibbons Ch. 2; Dutta Ch. 2–3; Watson Ch. 3
Module 3: Gibbons Ch. 3; Dutta Ch. 4; Watson Ch. 4 and Ch. 9
Module 4: Gibbons Ch. 4; Dutta Ch. 5; Watson Ch. 5
Module 5: Gibbons Ch. 5; Dutta Ch. 6; Watson Ch.10
Module 6: Gibbons Ch. 6; Dutta Ch. 7; Watson Ch. 7

**Pedagogical Approach:** Classroom teaching and problem-solving sessions.

**Additional information:**

Course prepared by Dr. Aditi Singhal

**Student responsibilities:**

Attendance, feedback, discipline: as per university rules

**Course reviewers:**

1. Dr Sonal Dua, Associate Professor, Jindal School of Governance and Public Policy, O.P. Jindal Global University, Sonepat, Haryana, India.
2. Dr Sanyyam Khurana, Assistant Professor, Ashoka University, Sonepat, Haryana, India.