**Game Theory and Business Strategy: An Economic Perspective (EC-230)**

**Arijit Sen**

Game Theory extends the analytical framework of ‘rational choice theory’ to study ‘interactive decision-making’. The course will present a systematic introduction to the core ideas in game theory, and the application of these ideas in diverse business situations. We shall study the following scenarios of ‘strategic interaction’: (a) competition vs. cooperation, (b) coordination and dis- coordination, (c) intentional and inadvertent signalling, and (d) winner-take-all contests. Game-equilibrium analysis will be applied to understand problems in sustaining cooperation, making credible threats and promises, achieving coordination, transmitting information, and bidding in auctions. We shall conclude with a discussion on the strategic aspects of bargaining and negotiations, focusing on the interplay between ‘value creation’ and ‘value capture’ that is inherent in ‘business strategy’ formulation.

**Course Topics**

1. **DECISIONS, GAMES, AND EQUILIBRIA**
   - Review of Decision Theory; From Decision Theory to Game Theory; Game Formulations;
   - Equilibrium in Static Games: Nash Equilibrium and Rationalizability; Equilibrium in Dynamic Games: Subgame-perfect Nash Equilibrium and Backward & Forward Induction
   - **Learning Objective:** *4

2. **COOPERATION DILEMMAS**
   - Prisoners’ Dilemmas in Economic and Social Interactions; Strategic Substitutes and Complements; Collective Action Problems; Commitment Moves and ‘Meta-strategies’ to mitigate Cooperation Dilemmas
   - **Learning Objective:** *4

3. **COORDINATION AND ANTI-COORDINATION**
   - Multiplicity and Non-existence of Pure-strategy Nash Equilibria in Games of Coordination and Anti-coordination; Interpreting Mixed-strategy Nash Equilibria; Nash Equilibria as Self-enforcing Agreements under Complete Information: Renegotiation-proof & Coalition-proof Nash Equilibria and Correlated Equilibria

4. **REPEATED AND DYNAMIC GAMES**
   - Repeated Games and Sustenance of Tacit Collusion; Repeated Games and Fair Coordination; Dynamic Games of Timing: Preemption, Concession, and Wars of Attrition
   - **Learning Objective:** *4

5. **STRATEGIC INTERACTION UNDER ASYMMETRIC INFORMATION**
   - Bayes-Nash & Perfect-Bayesian Equilibria in Games of Incomplete Information; Reputation-building in Multi-stage Games; Wars of Attrition under Asymmetric Information; Signalling Games: Belief-updating and Forward Induction Refinements
   - **Learning Objective:** *4
6. AUCTIONS AND CONTESTS
Bidding Strategies in Alternative Auction Formats; Interdependent Values and the Winner’s Curse; Auction Design Issues; Rent-seeking, Patent Races, and other Contests

7. BARGAINING AND NEGOTIATIONS
Bilateral Bargaining: The Nash Solution and the Alternating-offers Game; Contract Negotiations and the Hold-up Problem; Multilateral Bargaining and Coalition Formation

Learning Objective:*4

Reading Material:

Basic Text Martin Osborne: An Introduction to Game Theory (Oxford University Press)

Bedside Books Thomas Schelling: The Strategy of Conflict; Avinash Dixit & Barry Nalebuff: The Art of Strategy; and Adam Brandenburger & Barry Nalebuff: Co-opetition

Course Pedagogy One way to teach a rigorous course in Game Theory is to take the formal “definitions – theorems – proofs” approach. The current course will, in contrast, take a largely “intuitive” approach, where game theoretic concepts will be introduced and analyzed through a series of “game examples”. These examples will be presented in two ways. In some cases, a Discussion Game will be posted in the CourseWeb before a lecture, and will then be studied in class (it will help immensely if students ponder over the example before coming to class). In other cases, a Game Experiment will be held in class, and the experimental outcomes will be discussed in a subsequent lecture. Theoretical concepts and formal results will be developed through these two kinds of Game Examples.

Information on in-class Game Experiments There will be periodic game experiment sessions held in class, with there being one in the very first class (each session will be for about 15-20 minutes). The experiments will be pen-and-paper experiments, where each student will play against the “average strategy” of a “rival group of students” (this will be explained in class). Relative performance will determine individual score in an experiment.

Evaluation Scheme:

Course Evaluation Performance in the class experiments will constitute 15% of a student’s course grade. If N experiment sessions are held over the entire term (at this point in time, I do not know what N will turn out to be), a student’s \(N - 1\) best performances will count towards his/her course grade.

A 1.5 hour mid-term exam will constitute 35% of course grade, and a comprehensive 2 hour end-term exam will constitute 50% of course grade.
For a student who misses the mid-term exam (for valid medical reasons), the end-term exam will constitute 85% of the grade. If a student misses the end-term exam (for valid medical reasons), he/she will have to appear for a make-up exam (and will suffer a grade drop).

Note: * The numbers under the course topics reflecting Learning Objectives represent;
   1) Internationalism
   2) Business Embeddedness
   3) Responsible Citizenship
   4) Reflective Critical Thinking
   5) Comprehensive Leadership