MATH-475 Game Theory

Credit Hours: 3-0

Prerequisites: None

Course Objectives: Game Theory is the study of mathematical models of conflict and cooperation between intelligent rational decision-makers. The main objective of this course is understand the combinatorial games, cooperative and non-cooperative games, and Nash equilibrium.

Core Contents: Detailed Contents: Introduction to game theory, Nash Equilibrium, Mixed Strategy Equilibrium, Mixed Strategy Equilibrium, Extensive Games with Perfect Information.

Detailed Course Contents: Introduction to game theory: The theory of rational choice, Coming attractions. Nash Equilibrium (Theory): Strategic games, the Prisoner's Dilemma, Bach or Stravinsky, Matching Pennies, the Stag Hunt. Nash equilibrium, Examples of Nash equilibrium Best response functions, Dominated actions, Equilibrium in a single population: symmetric games and symmetric equilibria.

Nash Equilibrium (Illustrations): Cournot's model of oligopoly. Bertrand's model of oligopoly,Electoral competition, The War of Attrition.

Mixed Strategy Equilibrium: Strategic games in which players may randomize, Mixed strategy Nash equilibrium, Dominated actions, Pure equilibria when randomization is allowed.

Extensive Games with Perfect Information (Theory): Strategies and outcomes, Nash equilibrium.Subgame perfect equilibrium. Finding subgame perfect equilibria of finite horizon games: backward Induction.

Coalitional Games and the Core: Coalitional games, The core.

Text Book: Martin J. Osborne, An Introduction to Game Theory, Oxford University Press; Int edition (January 28, 2009)

Reference Book: Julio González-Díaz, Ignacio García-Jurado, M. Gloria Fiestras-Janeiro An Introductory Course on Mathematical Game Theory, 2010.

Weekly Breakdown		
Week	*Section*	*Topics*

1	1.1-1.3	Introduction to game theory: The theory of rational choice, Coming attractions.
2	2.1-2.3	Nash Equilibrium (Theory): Strategic games, the Prisoner's Dilemma, Bach or Stravinsky
3	2.4, 2.5	Matching Pennies, the Stag Hunt.
4	2.6, 2.7	Nash equilibrium, Examples of Nash equilibrium
5	2.8, 2.9	Best response functions, Dominated actions
6	2.10	Equilibrium in a single population: symmetric games and symmetric equilibria
7	3.1	Nash Equilibrium (Illustrations): Cournot's model of oligopoly.
8	3.2, 3.3	Bertrand's model of oligopoly, Electoral competition
9	**Mid Semester Exam**	
10	3.4	The War of Attrition
11	4.1-4.3	Mixed Strategy Equilibrium: Strategic games in which players may randomize, Mixed strategy Nash equilibrium,
12	4.4-4.5	Dominated actions, Pure equilibria when randomization is allowed.
13	5.1-5.4	Extensive Games with Perfect Information (Theory): Strategies and outcomes, Nash equilibrium.
14	5.5	Subgame perfect equilibrium.
15	5.6	Finding subgame perfect equilibria of finite horizon games: backward Induction.
16	8.1, 8.2	Coalitional Games and the Core: Coalitional games, The core
17		Revision
18	**End Semester Exam**	