Course Name: Game theory
Course code: CS4187
Credit: 3/0/0

Course Outcomes:

After successful completion of this course, a student will be able to:

CO1:Understand what is a “game” and hence identify strategic decision-making problems which can be solved using game-theoretic tools.

CO2:Judge what kind of game is best suitable to capture a decision-making problem.

CO3:Formulate a decision-making problem as a game.

CO4:Design algorithms to solve (simple) games and hence find the best strategy.

CO5:Design strategic environments such that the involved players behave in a way to achieve a common social goal.

Course Content :

Introduction and classification of games: setup for non-cooperative game theory (players, strategies, actions, payoffs, rationality, intelligence) with examples,different form of games: complete information simultaneous move games (strategic form games), and complete information sequential move games (extensive form games).

Solution concepts of games: solution concepts of a game like dominant strategy, iterative removal of non-dominant strategy, pure/mixed strategy Nash equilibrium and subgame perfect Nash equilibrium (for extensive form games). proof of existence of Nash equilibrium.

Games with incomplete information: more realistic games -own payoff. concept of Bayesian Nash equilibrium . Integral aspect of designing auctions .

Mechanism design: Mechanism design of “reverse engineering” , various forms of auction mechanisms .two theorems: revenue-equivalence theorems, and revelation principle, for designing auctions.

Games over networks: application of game theoretic concepts in setups involving a “graph structure”. concepts like routing games, War drop equilibrium, and network pricing ,application in wireless networks and transportation networks.

Advanced topics in game theory: algorithmic game theory to compute Nash equilibriums. cooperative game theory to achieve mutually beneficial outcomes.

Textbook:

1. Harrington, J.E., Games, Strategies, and Decision Making, 2nd edition, Worth Publishers: Macmillan Ed., 2015.
2. Y. Narahari, "Game Theory and Mechanism Design", volume 4, World Scientific, 2014.

References:

1. D. Fudenberg, J. Tirole, "Game Theory", MIT Press, 1991
2. N. Noam, T. Roughgarden, E. Tardos, and V.V. Vazirani, "Algorithmic Game Theory", Cambridge University Press, 2007.