Math 167: General Course Outline

Catalog Description

167. Mathematical Game Theory. (4) Lecture, three hours; discussion, one hour. Requisite: course 115A. Quantitative modeling of strategic interaction. Topics include extensive and normal form games, background probability, lotteries, mixed strategies, pure and mixed Nash equilibria and refinements, bargaining; emphasis on economic examples. Optional topics include repeated games and evolutionary game theory. P/NP or letter grading.

Schedule of Lectures

Lecture	Section	Topics
1	0.1 (p. 3-8), 0.1.3, 0.2, 0.3, 0.4.1	Strategic Voting, Second Price Auction, Non-cooperative, Nash Equilibrium, Cournot Duopoly
2	1.1-1.3	Trees, Nim, Strategies
3	1.4-1.5	Zermelo's Algorithm, Binary Analysis of Nim, Begin Zermelo's Theorem
4	1.7-1.9	Zermelo's Theorem, Chess, Value of a Strictly Competitive Game, Subgame Perfect Equilibrium, Team Games, etc.
5	2.1	Review of Probability, Bayes Rule
6	2.2-2.3	Lotteries, Expectation, Game Values
7	2.4-2.5	Duel, begin Parcheesi
8	Exercises	Parcheesi, Do problems in Class (e.g. Monty Hall, ex. 2.6.26, hat problem)
9	3.1-3.2, 3.4	Preferences, Utility, Optimizing Utility
10	3.4	Von Neuman-Morgenstern Utility, examples
11	3.4-3.5	St. Petersburg Paradox, Risk Averse, Risk Loving
12	4.1	Payoff Functions via Expectation; Strategic Form of Duel, Bimatrices, Finding Pure Strategy NE's
13	4.6	Domination
14	5.2-5.3	Convexity, Supporting Lines, Cooperative Payoff Regions, Pareto Efficiency
15	.	Midterm
16	5.4-5.5	Bargaining Sets, (Generalized) Nash Bargaining Problems and Solutions, Methods of Computation
17	5.5	Nash Axioms, Nash's Theorem and Proof
18	6.2-6.4	Minmax & Maxmin, Security Strategies, Mixed Strategies
19	6.4	Mixed Strategy Payoffs, Computing Mixed Security Strategies via Maxmin Analysis (Examples)
20	6.4-6.6	Maxmin<Minmax, Statement of Minmax Theorem, Solving Games via Separation
21	6.7 or 6.8	Battleships or Inspection
22	7.1	Best Response (=Reaction Curve) Analysis of Bimatrix Games, Prisoner's Dilemma & Chicken
23	7.2	Relation of NE's to Maxmin Solutions of Associated Zero-sum Games and Pareto Optimality, Correlated Equilibria
24	.	Theorem that $(p_1, ..., p_n)$ is an NE iff $supp(p_i)$ is contained in imax $\{\pi_i(p_1, ..., p_{i-1}, - , p_{i+1}, ..., p_n)\}$ for all i. Methods of computing Nash equilibria (2 player 2x3, 3x3 cases)
25	.	Computations, Word problems
26	7.2	Duopoly (Cournot, Stackelberg), Oligopoly, Perfect Competition
27	7.7	Sketch of Proof of Existence of NE

28	.	Review

Comments

Outline update: D. Blasius, 5/02

NOTE: While this outline includes only one midterm, it is strongly recommended that the instructor considers giving two. It is difficult to schedule a second midterm late in the quarter if it was not announced at the beginning of the course.

For more information, please contact Student Services, ugrad@math.ucla.edu.