Syllabus:

Introduction: rationality, intelligence, common knowledge, von Neumann-Morgenstern utilities;

Noncooperative Game Theory: strategic form games, dominant strategy equilibria, pure strategy Nash equilibrium, mixed strategy Nash equilibrium, existence of Nash equilibrium, computation of Nash equilibrium, matrix games, minimax theorem, extensive form games, subgame perfect equilibrium, games with incomplete information, Bayesian games.

Mechanism Design: Social choice functions and properties, incentive compatibility, revelation theorem, Gibbard-Satterthwaite Theorem, Arrow's impossibility theorem, Vickrey-Clarke Groves mechanisms, dAGVA mechanisms, Revenue equivalence theorem, optimal auctions.

Cooperative Game Theory: Correlated equilibrium, two person bargaining problem, coalitional games, the core, the shapley value, other solution concepts in cooperative game theory.

Text books:

1. Y. Narahari, Game Theory and Mechanism Design, IISc Press and the World Scientific, 2014.

References:

1. Roger B. Myerson, Game Theory: Analysis of Conict, Harvard University Press, September 1997.
2. Martin J. Osborne, An Introduction to Game Theory, Oxford University Press, 2003.

Code:MAT5013: Mathematical Finance Prerequisites: Probability theory and Differential Equations.	L	T	P	Credit
	3	2	0	4

Course Category	Elective
Course Type	Theory
Course Objective	The primary goal of this course is to teach students some necessary mathematical techniques and how to apply them to the fundamental concepts and problems in financial mathematics and their solution.
Course Outcome(s)	The main contents include: Introduction to probability theory, random variable, probability density, mean, and variance of a random variable. The applications include interest rate, coupon bonds, arbitrage, Brownian

	motion, geometric Brownian motion for mathematical models on stock price, etc.

Syllabus:
Introduction to investment securities and financial derivatives, Random walk, Brownian Motion, Geometric Brownian Motion, Interest rates and Present Value Analysis, Pricing Contracts via Arbitrage, Arbitrage Theorem, Black-Scholes Formula, Valuing by expected utility, Exotic Options, Models for Crude Oil data, Autoregressive Models and Mean reversion.

Text books:
1. S. M. Ross, An Elementary Introduction to Mathematical Finance, 3rd Edition, Cambridge University Press, 2011.

References:
1. John Hull, Options, Futures, and Other Derivatives, 8th Edition, Prentice Hall, 2011. 2. M. Baxter and A. Rennie, Financial Calculus: An Introduction to Derivative Pricing, Cambridge University Press, 1996.
3. Darrell Duffie, Dynamic Asset Pricing Theory, 3rd Edition, Princeton University Press, 2001. 4. Paul Wilmott, Sam Howison and Jeff Dewynne, The Mathematics of Financial Derivatives: A Student Introduction, Cambridge University Press, 1995.
5. J. P. Fouque, G. Papanicolaou and K. R. Sircar, Derivatives in Financial Markets with Stochastic Volatility,Cambridge University Press, 2000.

Code:MAT5014: Mathematical Methods Prerequisites:	L	T	P	Credit
	3	2	0	**4**

Course Category	Elective
Course Type	Theory
Course Objective	The main aim is to make students familiar with Laplace, Fourier transformations, extrema of functional through calculus of variations and integral equations.