Indraprastha College for Women
University of Delhi

Course Name:	B.Sc.(H) Mathematics
Paper Title:	Mathematical Finance
Unique Paper Code:	32357614
Semester:	VI
Faculty(s):	Ritika Gulati
Year:	2024

Work Plan			
Unit No.	Learning Objective	Lecture No.	Topics to be Covered
1	Introduction to the application of mathematics in financial world	1	Interest rates, Types of rates, Measuring interest rates,
		2	Interest rates, Types of rates, Measuring interest rates,
		3	Interest rates, Types of rates, Measuring interest rates,
		4	Zero rates, Bond pricing, Forward rate, Duration, Convexity,
		5	Zero rates, Bond pricing, Forward rate, Duration, Convexity,
		6	Zero rates, Bond pricing, Forward rate, Duration, Convexity,
		7	Exchange traded markets and OTC markets,
		8	Exchange traded markets and OTC markets,
		9	Exchange traded markets and OTC markets,
		10	Derivatives--forward contracts, Futures contract,
		11	Derivatives--forward contracts, Futures contract,

		12	Options, Types of traders, Hedging, Speculation, Arbitrage.
		13	Options, Types of traders, Hedging, Speculation, Arbitrage.
		14	Options, Types of traders, Hedging, Speculation, Arbitrage.
		15	Options, Types of traders, Hedging, Speculation, Arbitrage.
2	To understand some computational and quantitative techniques required for working in the financial markets	16	No Arbitrage principle, Short selling, Forward price for an investment asset,
		17	No Arbitrage principle, Short selling, Forward price for an investment asset,
		18	No Arbitrage principle, Short selling, Forward price for an investment asset,
		19	Types of options, Option positions,
		20	Types of options, Option positions,
		21	Underlying assets, Factors affecting option prices,
		22	Underlying assets, Factors affecting option prices,
		23	Bounds on option prices, Put-call parity,
		24	Bounds on option prices, Put-call parity,
		25	Bounds on option prices, Put-call parity,
		26	Early exercise, Effect of dividends.
		27	Early exercise, Effect of dividends.
		28	Early exercise, Effect of dividends.
		29	Early exercise, Effect of dividends.
		30	Early exercise, Effect of dividends.
3	To understand some computational and quantitative techniques required for working in actuarial mathematics	31	Binomial option pricing model, Risk neutral valuation (for European and American

			options on assets following binomial tree model),
		32	Binomial option pricing model, Risk neutral valuation (for European and American options on assets following binomial tree model),
		33	Binomial option pricing model, Risk neutral valuation (for European and American options on assets following binomial tree model),
		34	Binomial option pricing model, Risk neutral valuation (for European and American options on assets following binomial tree model),
		35	Lognormal property of stock prices, Distribution of rate of return,
		36	Lognormal property of stock prices, Distribution of rate of return,
		37	Lognormal property of stock prices, Distribution of rate of return,
		38	Lognormal property of stock prices, Distribution of rate of return,
		39	expected return, Volatility,
		40	expected return, Volatility,
		41	expected return, Volatility,
		42	estimating volatility from historical data, Extension of risk neutral valuation to assets following GBM
		43	estimating volatility from historical data, Extension of risk neutral valuation to assets following GBM
		44	Black–Scholes formula for European options.
		45	Black–Scholes formula for European options.
4	To understand some computational and quantitative techniques required for working in actuarial mathematics	46	Hedging parameters (the Greeks: Delta, Gamma, Theta, Rho and Vega),

		47	Hedging parameters (the Greeks: Delta, Gamma, Theta, Rho and Vega),
		48	Hedging parameters (the Greeks: Delta, Gamma, Theta, Rho and Vega),
		49	Trading strategies involving options,
		50	Trading strategies involving options,
		51	Swaps, Mechanics of interest rate swaps,
		52	Swaps, Mechanics of interest rate swaps,
		53	Comparative advantage argument,
		54	Comparative advantage argument,
		55	Valuation of interest rate swaps, Currency swaps,
		56	Valuation of interest rate swaps, Currency swaps,
		57	Valuation of currency swaps.
		58	Valuation of currency swaps.
		59	Valuation of currency swaps.
		60	Valuation of currency swaps.

Syllabus		
Unit	**Contents**	**Contac t Hours**
I	Interest rates, Types of rates, Measuring interest rates, Zero rates, Bond pricing, Forward rate, Duration, Convexity, Exchange traded markets and OTC markets, Derivatives--forward contracts, Futures contract, Options, Types of traders, Hedging, Speculation, Arbitrage.	15
II	No Arbitrage principle, Short selling, Forward price for an investment asset, Types of options, Option positions, Underlying assets, Factors affecting option prices, Bounds on option prices, Put-call parity, Early exercise, Effect of dividends.	15
III	Binomial option pricing model, Risk neutral valuation (for European and American options on assets following binomial tree model), Lognormal property of stock prices, Distribution of rate of return, expected return, Volatility, estimating volatility from historical data, Extension of risk neutral valuation to assets following GBM, Black−Scholes formula for European options.	15

IV	Hedging parameters (the Greeks: Delta, Gamma, Theta, Rho and Vega), Trading strategies involving options, Swaps, Mechanics of interest rate swaps, Comparative advantage argument, Valuation of interest rate swaps, Currency swaps, Valuation of currency swaps.	15
	Total	**60**

Text Books/Suggested Readings:

S. No.	**Name of Authors/Books/Publishers**	**Year of Publication/ Repr int**
1.	Hull, J. C., & Basu, S. (2010). Options, Futures and Other Derivatives (7th ed.). Pearson Education. New Delhi.	2010
2.		
3.		
4.		

	Paper Components		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**
5+1	**5**	**1**	**0**
	Assessment Scheme		
S.No.	**Component**	**Marking Scheme**	**Total Marks**
1	Internal Assessment	**10**	**25**
	● Assignment/Quiz/Project/ Presentation	10	
	● Class Test	5	
	● Attendance		
3.	Practical	0	0
	● Continuous Assessment		
	● End Term Written/Practical Exam		
	● Viva		

4.	End Semester Examination 75	75