Bharati College
(University of Delhi)
Janak Puri, Delhi- 100058
www.bharaticollege.du.ac.in

Lesson Plan (CORE, Semester VI, January, 2023 to June 2023)

Name of Teacher	Dr. Ankit Gupta	**Department**	Mathematics
Course	B.Sc (H) Mathematics	**Semester**	Six
Paper	Mathematical Finance	**Academic Year**	2022-23

Learning Objectives

This course is an introduction to the application of mathematics in financial world, that enables the student to understand some computational and quantitative techniques required for working in the financial markets and actuarial mathematics.

Learning Outcomes

On completion of this course, the student will be able to:

- Know the basics of financial markets and derivatives including options and futures.
- Learn about pricing and hedging of options, as well as interest rate swaps.
- Learn about no-arbitrage pricing concept and types of options.
- Learn stochastic analysis (Ito formula, Ito integration) and the Black−Scholes model.
- Understand the concepts of trading strategies and valuation of currency swaps.

Lesson Plan

Week No.	Theme/ Curriculum	Any Additional Information
Week 1-4	• 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.	Allocation of Assignment I
Week 5 – 8	• 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 • Binomial option pricing model, Risk neutral valuation (for European and American options on assets following binomial tree model)	Test Scheduled (Syllabus upto First Put-call parity)
Week 9 - 11	• 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 (without proof), Black−Scholes formula for European options.	
Week 12 - 14	• 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	Allocation of Assignment II

References

1. Hull, J. C., & Basu, S. (2010). Options, Futures and Other Derivatives (7th ed.). Pearson Education. New Delhi.

Additional Resources

1. Luenberger, David G. (1998). Investment Science, Oxford University Press. Delhi.
2. Ross, Sheldon M. (2011). An elementary Introduction to Mathematical Finance (3rd ed.). Cambridge University Press. USA.