Indian Institute of Technology Guwahati
Department of Mathematics
MA271: Financial Engineering - I (3-0-0-6)
Winter Semester of AY 2024-2025

Instructor: Professor Siddhartha Pratim Chakrabarty
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Teaching Assistant: Dr. Anupam Khatua (anupamkhatua@rnd.iitg.ac.in)

Prerequisites: MA 225 or equivalent

Syllabus:

Overview of financial engineering, financial markets and financial instruments; Interest rates, present and future values of cash flow streams; Riskfree assets, bonds and bond pricing, yield, duration and convexity, term structure of interest rates, spot and forward rates; Risky assets, risk-reward analysis, Markowitz's mean-variance portfolio optimization model and efficient frontier, CAPM; No-arbitrage principle; Derivative securities, forward and futures contracts and their pricing, hedging strategies using futures, interest rate and index futures, swaps; General properties of options, trading strategies involving options; Discrete time financial market model, Cox-Ross-Rubinstein binomial asset pricing model, pricing of European derivative securities by replication; Countable probability spaces, filtrations, conditional expectations and their properties, martingales, Markov processes; Risk-neutral pricing of European and American derivate securities.

Texts:

1. M. Capinski and T. Zastawniak, Mathematics for Finance: An Introduction to Financial Engineering, 2nd Ed., Springer, 2010.
2. S. Shreve, Stochastic Calculus for Finance, Vol. I, Springer, 2004.

References:

1. J.C. Hull, Options, Futures and Other Derivatives, 10th Ed., Pearson, 2018.
2. J. Cvitanic and F. Zapatero, Introduction to the Economics and Mathematics of Financial Markets, Prentice-Hall of India, 2007.
3. S. Roman, Introduction to the Mathematics of Finance: From Risk Management to Options Pricing, Springer, 2004.
4. D.G. Luenberger, Investment Science, 2nd Ed., Oxford University Press, 2013.
5. N.J. Cutland and A. Roux, Derivative Pricing in Discrete Time, Springer, 2012.

Lecture Timings: Slot A: Tuesday (9:00 AM-9:55 AM), Wednesday (10:00 AM-10:55 AM), Thursday (11:00 AM-11:55 AM)

Room: 5104

Evaluation and Grading Policy:

Quiz 1: 15 marks (Tentative Date: 29th January 2025)
Mid-Semester Exam: 30 marks (Date: As communicated by the Academic Section)
Quiz 2: 15 marks (Tentative Date: 27th March 2025)
End-Semester Exam: 40 marks (Date: As communicated by the Academic Section)

Your grades will be based on your score out of these 100 marks.