

Financial Engineering-I

1.1 Course Number: MA 241

1.2 Contact Hours: 3-0-0 Credits: 09

1.3 Semester-offered: 2nd Year-Even

1.4 Prerequisite: Basic knowledge of elementary calculus, probability and some linear algebra.

1.5 Syllabus Committee Member: Dr. C. Kundu, and Dr. M. K. Rajpoot, Dr. A. Kumar, Dr. G. Rakshit.

2. **Objective:** This course aims at providing the knowledge of financial market, risk attached, and financial derivatives on underlying asset

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Introduction	Some basic definitions and terminology: Basic Notions and Assumptions, No-Arbitrage Principle, One-Step Binomial Model, Risk and Return, Forward and Futures Contracts, Call and Put Options, Managing Risk with Options.	06
2	Risk-Free Assets	Time Value of Money; Simple Interest, Periodic Compounding, Streams of Payments, Continuous Compounding, How to Compare Compounding Methods. Money Market; Zero-Coupon Bonds, Coupon Bonds, yield, Money Market Account.	06
3	Risky Assets	Dynamics of Stock Prices; Return, Expected Return. Binomial Tree Model; Risk-Neutral Probability, Martingale Property.	06
4	Discrete Time Market Models	Stock and Money Market Models; Investment Strategies, The Principle of No Arbitrage, Application to the Binomial Tree Model, Fundamental Theorem of Asset Pricing.	06
5	Options: General Properties	Definitions, Put-Call Parity, Bounds on Option Prices, Variables Determining Option Prices, Time Value of Options.	06
6	Option Pricing and Financial Engineering	European Options in the Binomial Tree Model, American Options in the Binomial Tree Model, Black-Scholes Formula. Hedging Option Positions, Hedging Business Risk, Speculating with Derivatives.	09
		Total	39

4. Readings

4.1 Textbook:

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.

4.2 Reference books:

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.

5 Outcome of the Course:

At the end of the course the students will be able to understand the financial market, market models, risk attached, and basic option pricing theory.