Financial Engineering-I

1.1   Course Number: MA 241

1.2   Contact Hours: 39 (L)   Credits: 09 [LTP: 3-0-0]

1.3   Semester-offered: 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 (Convener), 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.