MA837   **MATHEMATICAL AND STATISTICAL ANALYSIS**   **3-0-0-3**

Unit-I

Introduction to financial terms and concepts: Review definition of put and call options–hedge funds. Give a review on basic linear algebra: Manipulation of Matrix algebra – Eigenvalues and Eigenvectors – Determinants

Unit-II

Probability and Statistics: Review probability –Conditional probability –Independence – Mutually exclusive – Random variables –Stochastic processes –Regression Analysis –Time series Analysis –Discuss how to price risk models–Why we code: Discussion on the importance of coding–Installing Python–Getting students to be comfortable with simple coding

Unit-III

Financial modelling: Advanced time series –Portfolio Theory–Factor Modeling –Portfolio Management – Advanced Stochastic processes–Python notation: Notation of String –Lists–Dictionaries–Booleans–Integers–Implement basic code for string manipulation and create functions –Mathematics in Python: Conditional statements–if, else, or, and–for loops–Applying conditional statements to mathematical concepts–review built in functions

Unit-IV

Stochastic Calculus: Ito Calculus –Black-Scholes formulation –Option pricing – Stochastic differential equations-Introduction to counterparty credit risk– Statistics in Python: Implementing basic statistics–Calculating averages, median–Standard deviation–Variance–Correlation–Regression

Unit-V

Numerical schemes: Overiew of differential equations-Seperable-Integrating Factor-second order and high-Euler Method –Explicit –Implicit – Runge-Kutta-Applying these in a programming language

TEXT BOOKS/ REFERENCES:

1) Hull, John. *Options, Futures, and Other Derivatives*. Prentice Hall, 1997

2) Baxter, Martin, and Andrew Rennie. *Financial Calculus: An Introduction to Derivative Pricing*. Cambridge University Press, 1996

3) Wilmott, Paul, Sam Howison, and Jeff Dewynne. *The Mathematics of Financial Derivatives: A Student Introduction*. Cambridge University Press, 1995.

4) Grinold, Richard C., and Ronald N. Kahn. *Active Portfolio Management: Quantitative Theory and Applications*. Probus Pubulication Company, 1995

5) Tsay, Ruey S. *Analysis of Financial Time Series*. Wiley-Interscience, 2001