Course descriptions

Financial Mathematics

Allameh Tabataba’I University

Number OF Credits: 32

Program: Master’s degree

Faculty: Economics

MATH 100: Investment Mathematics

Number of Credits: 3

Course: 48

Syllabus:

Cumulative Function - Simple Interest - Composite Interest - Present Value and Discount - Nominal Interest Rate - Interest Rate - Value Equation - Time Rate of Return - Types of Pensions - Unknown Time Unknown Interest Rate - Continuous Pensions - Variable Pensions - Loan Depreciation -Loan depreciation table-Depreciation funds-Capital return rate-Stock pricing -Office value

MATH 101: Financial Engineering

Number of Credits: 3

Course: 48

Syllabus:

Futures market mechanism - Risk hedging strategies using futures contracts - Trading options market mechanism - Strategies including options options - Properties of stock options - Binary tree and Black-Scholes-Merton model for pricing options - Options Zinc Stock Index-Futures Trading Options - Greek Letters-Unusual Options

MATH 102: Measurement and Probability Theory

Number of Credits: 3

Prerequisites: Mathematical Analysis II- Probability and Statistics I

Course: 48

Syllabus:

Algebra-Size-Probability Size-Measurable Functions-Simple Random Variables-Uniform and Dominant Convergence Theorems-Mathematical Hope-Multiplicative Product Size-Phobin theorem-Variable change formula-Convergence types in size-Strong large-number theorem for random variables-Hilbert space-Raden-Nicodine theorem-Levy continuity theorem-Centripetal theorem for random variables.

MATH 103: Financial and Economic Time Series

Number of Credits: 3

Course: 48

Syllabus:

Simultaneous equations-Dynamic econometric models-Causality-Prediction-Univariate and multivariate non-static time series models-Random step tests and

limit variance-Estimation of capital assets-Multifactorial-Stock returns-Forecast and variance Stocks-Pricing models of derivatives-Time structure of interest rates.

MATH 104: Financial Markets Economics

Number of Credits: 3

Course: 48

Syllabus:

The reason for the existence of financial markets - market players and different ways of financing - Overview of financial issues (role of markets and financial institutions - financial intermediaries and financial innovations) - Monetary policies and theories (role of government in financial markets) - Financial markets And Economic Efficiency (Financial Security - Transaction Costs - Liquidity - Asymmetric Information Problems) - Secure Financial Markets - Non-Bank Financial Markets (Insurance Companies) - Commercial Banking (Commercial Bank Resources and Use of Funds - Banking Rules - Bank Management - Bank Performance - International Banking).

MATH 105: Numerical Analysis (Computations) In Financial Mathematic

Number of Credits: 3

Prerequisites: Financial Mathematics I- Numerical Analysis II

Course: 48

Syllabus:

Methods and ideas of numerical analysis - Numerical solution of ordinary differential equations - Introduction to random calculations and pricing -Belco-Scholes formula - two-sentence method - finite and triangular difference method - Monte Carlo methods and its application in interest rate models.

MATH 106: Stochastic processes

Number of Credits: 3

Prerequisites: Measurement and Probability Theory

Course: 48

Syllabus:

Filters - Rodin Nicodine Theorem - Conditional Probability and Conditional Hope Conditional of a Sigmatic Field - Convergence Theorems for Conditional Hope - Regular Conditional Probability - Martingales with Discrete Parameter - Martingales and Uniform Integrity - Relationship between discrete Markov chains and martingales - Stop times - Optional sampling theorem - Introducing martingales with continuous parameter - Brownian motion as a Gaussian process - Brownian motion - Continuity and derivation of Brownian motion - integral ito - Formula ito-Stochastic differential equations - Theorem of existence and strong unity of stochastic differential equations with Lipschitz coefficients.

MATH 107: Financial Mathematic I

Number of Credits: 3

Prerequisites: Stochastic processes &Measurement and Probability Theory

Course: 48

Syllabus:

Financial Derivatives - Presenting the Techniques Used in the Financial Industry for Analyzing Financial Derivatives - The Problem of Discrete Financial Derivatives Pricing - Introduction to the Problem of Financial Derivatives Pricing - Conditional Hope and Martingales - Stochastic Differential Equations - Black-Schulz Differential Equations and the resulting formula for option pricing - Completing the continuous pricing problem - Gisanov conversion.

MATH 108: Seminar

Number of Credits: 2

MATH 109: Thesis

Number of Credits: 6