

Details of the Study Programme

B.Sc. in Financial Engineering

Programme Structure

LEVEL I : DIPLOMA IN FINANCIAL ENGINEERING

Course Code	Title	No.of Hours	No. of Credits	Type
FE 1002	Mathematics for Finance	30L	2C	Foundation
FE 1011	Calculus for Finance	30L	2C	Foundation
FE 1012	Linear Algebra	30L	2C	Foundation
FE 1007	Business English	30L	2C	Supplementary
FE 1014	Financial Markets & Instruments	30L	2C	Supplementary
FE 1001	Economics I for Finance	30L	2C	Core
FE 1003	Accounting I for Finance	30L	2C	Core
FE 1004	Statistics I for Finance	30L	2C	Core
FE 1005	Applied Finance	30L	2C	Core
FE 1006	Computing for Finance	30L	2C	Core
FE 1008	Management Science I	30L	2C	Core
FE 1009	Economics II for Finance	30L	2C	Core
FE 1010	Quantitative Methods for Finance	30L	2C	Core
FE 1013	Mathematical Modeling I for Finance	30L	2C	Core
FE 1015	Numerical Methods I for Finance	30L	2C	Core

LEVEL II : ADVANCED DIPLOMA IN FINANCIAL ENGINEERING

Course Code	Title	No.of Hours	No. of Credits	Type
FE 2012	Accounting Standards, Practices, Ethics, Rules & Regulation	30L	2C	Foundation
FE 2002	IT for Finance	30L	2C	Foundation
FE 2007	Utility Theory & Insurance	30L	2C	Foundation
FE 2004	Corporate Finance	30L	2C	Supplementary
FE 2008	Investment Analysis I	30L	2C	Supplementary
FE 2001	Accounting II for Finance	30L	2C	Core
FE 2003	Financial Risk Management I	30L	2C	Core
FE 2005	Management Science II	30L	2C	Core
FE 2006	Regression & Time series	30L	2C	Core
FE 2009	Actuarial Models for Financial Markets	30L	2C	Core
FE 2010	Mathematical Modeling II for Finance	30L	2C	Core
FE 2011	Financial Risk Modeling	30L	2C	Core
FE 2013	Financial Statement Analysis	30L	2C	Core
FE 2014	Numerical Methods II for Finance	30L	2C	Core
FE 2015	Banking and International Finance	30L	2C	Core

LEVEL III : DEGREE IN FINANCIAL ENGINEERING

Course Code	Title	No.of Hours	No. of Credits	Type
FE 3005	Stochastic Calculus for Finance Strategic Financial Decision	30L	2C	Foundation
FE 3006	Theory	30L	2C	Foundation
FE 3010	Financial Report Writing	60L	2C	Foundation
FE 3012	Case Study	60L	2C	Supplementary
FE 3013	Seminar	60L	2C	Supplementary
FE 3009	Compliance Practices in Finance Information Systems	30L	2C	Supplementary
FE 3001	Investment Analysis II Financial Instruments and Risk	30L	2C	Core
FE 3002	Management Advanced Computational	30L	2C	Core
FE 3003	Modeling	30L	2C	Core
FE 3004	Management Science III	30L	2C	Core
FE 3007	Portfolio Management	30L	2C	Core
FE 3008	Information Systems	30L	2C	Core
FE 3011	Project	180L	6C	Core

Course type percentages

	Foundation (No. of Credits)	Core (No. of Credits)	Supplementary (No. of Credits)
Level I	6	20	4
Level II	6	20	4
Level III	6	18	6
Total	18	58	14
Total (%)	20%	64%	16%

Detailed Syllabus

FE 1001 Economics I for Finance (30L, 2C)

An introduction to microeconomics, The tools of microeconomic analysis, Demand, supply and the market, The effect of price and income on demand quantities, The theory of consumer choice, Firms and firm behaviour, Developing the theory of supply and costs of production, Perfect competition and pure monopoly, Market structure and imperfect competition, Factor markets, Labour markets, Risk in economic life.

Assessment : Assignments and end of semester written examination.

FE 1002 Mathematics for Finance (30L, 2C)

Introduction to Set Theory, Induction, Logic – Truth Tables and Quantifiers, Types of Proofs, Relations and Functions, Inequalities, Graphs, Difference Equations and Their solutions with applications in Finance.

Assessment : Assignments and end of semester written examination.

FE 1003 Accounting I for Finance (30L, 2C)

Introduction to Accounting and its environment, Financial Statements, Ledger accounting, Profit and Loss Account, Balance Sheet, Trial balance, Trading and Manufacturing Account, Bank reconciliation, Intangibles, Suspense accounts, Control of cash and bank transactions, Inventories, Income and Expenditure Account and Accounts for small business unit, Incomplete records, Cost Accounting Cost classification, Materials and Stocks control, Labor cost allocation and Overheads classification and analysis, Absorption and Marginal costing, Financial Accounting packages.

Assessment : Assignments and end of semester written examination.

FE 1004 Statistics I for Finance (30L, 2C)

Introduction to Statistical Concepts, Descriptive Statistics, Data and Representation, Types of Variables, Qualitative, Quantitative, Continuous, Discrete, Measures of Central Tendency, Measures of Spread, Measures of Shape, Introduction to Normal distribution, Standard Normal distribution, Introduction to Estimation, Estimating

the Population mean, Sampling, Inference, Hypothesis Testing, P-value, EXCEL functions for Statistics.

Assessment : Assignments and end of semester written examination.

FE 1005 Applied Finance (30L, 2C)

Interest rate, Simple and Compound interest rate, Time value of Money, Present value, Future value, Discounting, Compounding, Effective rate of return (EAR), Basic annuity valuation, Annuity immediate, Annuity due, Perpetuity, Discounted cash flow analysis, NPV, Bond valuation, Loan repayment methods, Internal rate of return (IRR), interest rate on fund, Excel financial functions and their applications.

Assessment : Assignments and end of semester written examination.

FE 1006 Computing for Finance (30L, 2C)

Using worksheet application for finance:-Introduction to the Electronic Worksheet, Worksheet basics, Manage worksheets, Formatting worksheet cells, Information visualizing, Viewing and printing, Using formulas, Using math and basic statistical functions, Working with dates, time and text, Basic finance functions, Lookup and reference of cells, Using logical functions, Scenarios and goal seek, Information visualizing and charts, Organize and analyze data using tables, Automate worksheet tasks, Understanding Macro, Spreadsheet Programming.

Assessment :Continuous assessment.

FE 1007 Business English (30L, 2C)

This course is designed for intermediate students of English as a second language who wish to improve their written and spoken business communication skills. The course focuses on level-appropriate grammar, introduces vocabulary specific to various business domains, and familiarizes students with the finer points of business etiquette and business correspondence. Emphasis would be placed on telephone skills, email etiquette, reading and gathering information from authentic business articles, business writing skills (memo, minutes, letters, and reports) and presentations skills.

Assessment : Assignments and end of semester written examination.

FE 1008 Management Science I (30L, 2C)

Overview of Operations Research, Concept of a model, Important topics of Operations Research and Scope of it, A tool for Decision support system, Introduction to Linear programming, formulating problems and their features, Applications in financial and economics fields, Graphical method, Simplex method, Two Phase Method, Special cases of Linear Programming, Dual problem, Economical interpretation of models, Excel solvers for LP problems.

Assessment : Assignments and end of semester written examination.

FE 1009 Economics II for Finance (30L, 2C)

The determination of national income and measuring GDP, Aggregate demand, fiscal policy and foreign trade, Money and banking, Central banking and the monetary system, Monetary and fiscal policy in a closed economy, Aggregate supply, the price level and the speed of adjustment, Unemployment, Inflation, Open economy macroeconomics, Economic growth, The business cycle.

Assessment : Assignments and end of semester written examination.

FE 1010 Quantitative Methods for Finance (30L, 2C)

General Probability: Set functions including set notations and basic elements of Probability, Mutually exclusive events, Addition and Multiplication rules, Independence of events, Combinatorial Probability, Bayes Theorem/Law of Probability. Univariate probability Distributions: Probability functions and Probability density functions, Cumulative distribution functions, Mode, Median, Percentiles, Moments Variance and measures of Dispersion ; Including Binomial, Negative Binomial, Poisson, Uniform, Exponential, Gamma, and Normal distributions. Multivariate Probability Distributions: Joint probability functions and probability density functions, Joint Cumulative distribution functions, Central Limit Theorem, Conditional and Marginal Probability distributions, Covariance and Correlation coefficient, Transformations and order statistics.

Assessment : Assignments and end of semester written examination.

FE 1011 Calculus for Finance (30L, 2C)

The Concept of Limit, Continuity, Intermediate Value Theorem, Absolute Extrema for Continuous Functions, Derivatives and Partial Derivatives, Maxima and Minima of Differentiable Functions of One and More Variables, Curve Sketching, Taylor Series and Integral Calculus, Sequences and Series, Concepts of Convergence, Applications in Finance and Economics fields.

Assessment : Assignments and end of semester written examination.

FE 1012 Linear Algebra (30L, 2C)

Matrices, Rank, Determinants, Non-singular matrices, Systems of Linear Equations, Solutions to system of linear equations, Vector Spaces sub spaces, Null space, Basis and dimension, Linear Transformations, Change of basis, Matrix representation of a linear transformation, Inner Product Spaces, Eigen Values and Eigen Vectors, QR factorization, Quadratic Forms, Linear Functional, Applications in Finance

Assessment : Assignments and end of semester written examination.

FE 1013 Mathematical Modeling I for Finance (30L, 2C)

Introduction to Mathematical Modeling in Finance, Ordinary Derivatives of Functions: Physical interpretations and real life applications. First order linear equations and applications, Separable equations: Population /Radio active decay classical models and Applications in financial instruments. Orthogonal Trajectories, Exact Equations, Existence and Uniqueness Theorem Applications without proof, Relationship between Differential equations and difference equations (in computing annuities and loan installments), Second order linear differential Equations, Algebraic properties of solutions, Linear Equations with constant coefficients: Real roots, Complex roots, Reduction of Order, Non-homogeneous equations and their applications.

Assessment : Assignments and end of semester written examination.

FE 1014 Financial Markets & Instruments (30L, 2C)

Types of Financial market and their characteristics, Equity market, Forex market, Insurance market, Bonds, Introduction to T- bills, Options, Derivatives, Mutual Funds, Financial indices and their characteristic, Example of Financial indices (Sri-Lankan and Global context), Dynamics of World Markets; Financial and Commodity Markets.

Assessment :Continuous assessment.

FE 1015 Numerical Methods I for Finance (30L, 2C)

Introduction to Numerical methods, Needs of Numerical methods in Financial Field, Taylor's Theorem and its various forms, Orders of Convergence; Big O and small O, Sources of Errors, Solutions for non-linear equations; Bi-section Method, Newton Raphson Method and their convergence, Interpolation Techniques, Numerical Integration, Numerical Methods for Linear Systems; Direct Methods, Iterative Methods, Simple Iteration, Applications in Finance and Economics fields, Matlab codes for the described Numerical Methods.

Assessment : Assignments and end of semester written examination.

FE 2001 Accounting II for Finance (30L, 2C)

Manufacturing and Departmental accounts, Budgets and budgetary control, Standard costing and variances, Integrated accounting systems and using Cost accounting packages, Profit oriented Vs not for Profit organization, Partnership Vs Limited Liability Companies, Formation of companies, Operation of companies and its reporting, cash flow statements and Accounting Vs Budgetary systems.

Assessment : Assignments and end of semester written examination.

FE 2002 IT for Finance (30L, 2C)

Using numerical computing applications for finance:-Introduction to MATLAB, Creating Arrays, Mathematical operations with arrays, Curve plotting, MATLAB functions, programming in MATLAB Common mathematics functions, Basic Differential calculus and Integral calculus, Descriptive Statistical functions, Basic Vector operations.

Assessment : Continuous assessment.

FE 2003 Financial Risk Management I (30L, 2C)

Scope of Financial Risk; the subprime crisis, Typology of financial risks, Financial market participants, Why is risk a separate discipline today? Introduction to Risk; Market Risk, Financial Risk, Credit Risk, Operational Risk, Risk Measures, Available Tools and Utilities, Quantification of Risk, Risk management concepts, Types of Risk management and their limitations.

Assessment : Assignments and end of semester written examination.

FE 2004 Corporate Finance (30L, 2C)

Introduction to corporate finance and related applications, Corporate Securities as contingent claims on total firm value, The corporate firms, Goals of the corporate firm, Financial Markets, varying interest rate valuation, Annuity valuation, Amortization and sinking fund, Internal rate of return and its applications, Bond valuation and analysis, stock valuation, foreign currency rate, interest rate modeling, term and risk structure of interest rate, holding rate.

Assessment : Assignments and end of semester written examination.

FE 2005 Management Science II (30L, 2C)

Linear programming problems in higher dimensions, Various techniques for LP problems, Sensitivity analysis of the problems, Classical optimization techniques for Finance and Economics problems (including Lagrange Multipliers), Optimization algorithms, Introduction to Dynamic Programming, Capital budgeting problem, Reliability improvement problem, Shortest path problem, Solution to Linear Programming problem through Dynamic Programming, Excel (or equivalent software) solvers for problems.

Assessment : Assignments and end of semester written examination.

FE 2006 Regression & Time series (30L, 2C)

Simple/Multiple Regression, Scatter plots and Regression lines, Correlation, Correlation and Regression, Coefficient of Determination, Introduction to the Chi-square distribution, Testing a single population variance, Chi-square goodness of fit test, F distribution and F-test, ANOVA, Financial Time Series, EXCEL functions.

Assessment : Assignments and end of semester written examination.

FE 2007 Utility Theory & Insurance (30L, 2C)

Introduction to Insurance, Types of Insurance, Financial Risk and Insurance, Introduction to Utility Theory and its Applications in Economics, Consumer preference, Choice base approach, Consumer Utility Maximization Problems and Expenditure Minimization Problems, Utility and Insurance Market, Utility and Risk Averse, Risk Lover and Risk Neutral, Utility and Introduction to Investment Strategies, Simple Portfolio Analysis.

Assessment : Assignments and end of semester written examination.

FE 2008 Investment Analysis I (30L, 2C)

Introduction to discounted cash flow analysis, NPV, IRR, Payback Period, Discounted Payback Period, and Related Investment decision Criteria, Incremental cash flows, Inflation and Capital Budgeting, Capital Market theory, Returns, Risk Statistics, Cost of Capital and Capital Budgeting, Maximizing firm value versus Maximizing Stockholder interests, Taxes, Adjusted present value approach, Capital budgeting with estimated rate of discount. **Assessment :** Assignments and end of semester written examination.

FE 2009 Actuarial Models for Financial Markets (30L, 2C)

Survival distributions and Life Tables: Probability for the age-at-death, the survival function, Time-until-death for a person age x , Curtate-future-lifetimes, Force of Mortality, Some analytical laws of mortality. Life Insurance: Insurances payable at the moment of death, Level benefit insurance, Endowment Insurance, Deferred insurance, Varying benefit insurance, Relationships between insurances payable at the moment of death and the end of the year of death. Life Annuities: Continuous life annuities, Discrete life annuities, Life Premiums: Fully continuous premiums, Fully discrete premiums. Benefit reserve: Fully continuous benefit reserves, other formula for benefit reserves, Fully discrete benefit reserves, Benefit reserves on a semi-continuous basis, Recursion relations for fully discrete benefit reserves. Actuarial Present value and their numerical evaluation on Benefit premiums and reserves, Analysis of benefit reserves.

Assessment : Assignments and end of semester written examination

FE 2010 Mathematical Modeling II for Finance (30L, 2C)

Introduction to Partial Differential Equations, Problem Formulation, Classifications, Parabolic Equations, Linear Parabolic Equations, Fundamental Solution of Parabolic Equations, Applications in Finance and Economics, Dynamical systems, Applications of Dynamical systems, Numerical Methods for PDE, Fourier Transform Techniques for solving PDE, Matlab codes for PDE, Dynamical Systems, and described Systems.

Assessment : Assignments and end of semester written examination.

FE 2011 Financial Risk Modeling (30L, 2C)

Credit Risk models, Financial Risk, Fixed Income Risk, Durations and interest rate volatility, Duration Matching, Nonlinearity and convexity risk, Vega risk, Assets and Liabilities, Value at Risk, Volatility estimation, Modes of computation; parametric, historical, Computation using Excel.

Assessment : Assignments and end of semester written examination.

FE 2012 Accounting Standards, Practices, Ethics, Rules & Regulation (30L, 2C)

Introduction to Accounting Standards, Introduction to the Global Investment Performance Standards, Global Investment Performance Standards, Code of Ethics in Accounting, Insurance, Banking and Finance practising, Code of Practices in Accounting, Insurance and Banking, Rules and Regulation in Insurance, Accounting, Banking and Financial Practices. **Assessment :** Assignments and end of semester written examination.

FE 2013 Financial Statement Analysis (30L, 2C)

Introduction to Financial Statements, Types of Financial statements, Financial statements analysis, Horizontal Analysis, Vertical Analysis, Common-Size Statements, Trend Percentages, Ratio Analysis, Types of Ratios, Liquidity Ratios, Equity Ratios, Profitability Tests, Market Tests, Current Ratio, Acid-test Ratio, Accounts receivable turnover, Inventory turnover, Total assets turnover, Return on Operating assets, Profit Margin, Return on Average Common stockholders' equity, Cash flow margin, Working Capital, Net Income to Net Sales.

Assessment : Continuous assessment.

FE 2014 Numerical Methods II for Finance (30L, 2C)

Numerical Methods for Linear Systems; Direct Methods (Gaussian, Jacobi, Gauss-Schiedel), Iterative Methods, Simple Iteration, Numerical Methods for ODEs, Euler Method, Runge-Kutta Method, Linear Multi-step Methods and their Convergence with Applications in Finance, Matlab Codes for described Numerical Methods.

Assessment : Assignments and end of semester written examination.

FE 2015 Banking and International Finance (30L, 2C)

Introduction to Banking systems, Bank Liquidity management, Bank Asset and Liability Management, Banking history, Banking regulations, The Savings and Loan Crisis, The Supply of Money; Multiple Deposit Creation, Determination of the Money Supply, Depositor and Bank behaviour, Monetary base, Exchange Rates, Foreign Exchange Markets, International Finance, Transactions motive, Speculative motive, How does Money affect the Economy.

Assessment : Assignments and end of semester written examination.

FE 3001 Investment Analysis II (30L, 2C)

Introduction to Financial Decision Problems, Decision under Certainty, Uncertainty, Risk and their Application in Financial Market, Introduction to Network Modeling and its application in Finance, Financial Project Management, Project Scheduling Models, Time, Cost, Profit Optimization Problems, Economic life of an asset, Determination of Economic life of an asset, Replacement and maintenance analysis

Assessment : Assignments and end of semester written examination.

FE 3002 Financial Instruments and Risk Management (30L, 2C)

Types of Financial instruments and their valuations; Forwards, Futures, Options, Risk Modeling of Financial Instruments, Stress testing and simulation, Black Scholes Pricing, Option Greeks, Measuring credit risk and the probability of default, Operational risk, Developing a hedging strategy and its applications, Financial crises, Bubbles, Extreme Volatility, Financial Market behaviour during extreme events.

Assessment : Assignments and end of semester written examination.

FE 3003 Advanced Computational Modeling (30L, 2C)

Introduction to Neural Network, Single layer linear Neural Network, Learning rules, Threshold Networks, Multi layer Networks, Multilayer Networks with Learning, Applications in Finance, Introduction to Genetic algorithm and its applications in Finance. Implementation of Neural Network and Genetic algorithms, Forecasting Financial Data using Neural Network techniques, Random Number Generation for Various Distributions, Monte Carlo Simulation and its applications.

Assessment :Continuous assessment.

FE 3004 Management Science III (30L, 2C)

Operational techniques for Finance and Economics, Queuing theory and its applications to Finance and Banking sectors, Introduction to Quadratic Programming, Applications of Quadratic Programming in Finance and Economics, Problem formulation, Constrained quadratic programming problems, Equality constrained quadratic programming, KKT matrix and reduced Hessian, Global minimiser, Direct solution of the KKT system and various methods to solve KKT system.

Assessment : Assignments and end of semester written examination.

FE 3005 Stochastic Calculus for Finance (30L, 2C)

Introduction to Stochastic Processes and their applications, Binomial Tree, Binomial Option Pricing, Normal and Lognormal random variables, Discrete Time Martingales, Continuous Time Martingales, Brownian Motion and Model of Fair Game, Introduction to Stochastic Differential Equations and their application in Finance, Introduction to Wiener Process and its applications in Finance.

Assessment : Assignments and end of semester written examination.

FE 3006 Strategic Financial Decision Theory (30L, 2C)

Generalized the Financial Decision Problems, Introduction to Game Theory and its applications in Finance, Economics and other Disciplines, Various Classical Games (Zero Sum, Battle of Sexes, Prisoner's Dilemma) and their applications, Types of game: Perfect/Imperfect information, Simultaneous/Sequential, Dynamic/Stochastic, Repeat Games, Nash Equilibrium, Pareto equilibrium, Pure and mixed Strategy, Bargaining, Sealed bid Auction, Duopoly Problem, Cournot and

Bertrand competition, Financial Simulation and Game Theory, Prisoners' Dilemma game its direct applications to Economics and Finance, Entry deterrence.

Assessment : Assignments and end of semester written examination.

FE 3007 Portfolio Management (30L, 2C)

Introduction to Financial Portfolio, Portfolio Returns and Risk Measures; Sharp Ratio, Information Ratio and other Extended Risk Measures, Short Selling, Portfolio proportion, Return on Short sale, Modeling Returns, Criterion for Portfolio Construction and Asset Allocation; Portfolio Optimization.

Assessment : Assignments and end of semester written examination.

FE 3008 Information Systems (30L, 2C)

Introduction to Information Systems, Organization structure and Information system, Hardware and software, Data and information management, Network and telecommunication, Internet and web, E-commerce and mobile commerce, Enterprise systems, Decision support systems, Knowledge management systems, specialized information systems, System development.

Assessment : Assignments and end of semester written examination.

FE 3009 Compliance Practices in Finance Information Systems (30L, 2C)

Information system and society, Information Security, Information Technology and Security Policy, Business continuity Plan, Information System Audits, Software Licensing, Information technology law in Sri Lanka.

Assessment : Assignments and end of semester written examination.

FE 3010 Financial Report Writing (60P, 2C)

Generates customized balance sheets, income statements, profit and loss statements, financial ratios, cash flows and other financial reports, Easily filters financial reports by any business segment, such as department, cost centre, division, or company, Simplifies financial consolidation review and comparisons.

Assessment :Continuous assessment.

FE 3011 Project (180P, 6C)

Individual or group of students will be assigned a Mathematical Finance research project of one-year duration. A dissertation submitted on the project will be examined at a seminar presentation.

Assessment :Dissertation and oral presentation.

FE 3012 Case Study (60P, 2C)

Individual or group of students will be assigned Case Study in Finance, Economics, Financial Modeling, Insurance, Banking or any related fields of three months duration. A report submitted on the case study will be examined at a presentation.

Assessment :Continuous assessment.

FE 3013 Seminar (60P, 2C)

Individual or group of students will be assigned current topics in Finance, Economics, Financial Modeling, Insurance, Banking or any related fields of three months duration. A report submitted on the case study will be examined at a presentation.

Assessment :Continuous assessment.