

2022

MSc/PG Diploma in Financial Mathematics

Handbook



***Financial Engineering (FE)
Financial Analysis (FA)***

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MSc (Coursework)/PG Diploma in Financial Mathematics – 2022

The MSc/PG Diploma in Financial Mathematics aims to provide a professional development package for professionals in the discipline of Finance, Insurance, Banks, Financial Analysis, Financial Consultancy and Financial Simulation sectors. The award of the degree will provide its recipients with a valuable professional qualification. Considering new trends in the field of quantitative finance, starting from year 2020 batch, the program provides two pathways, namely,

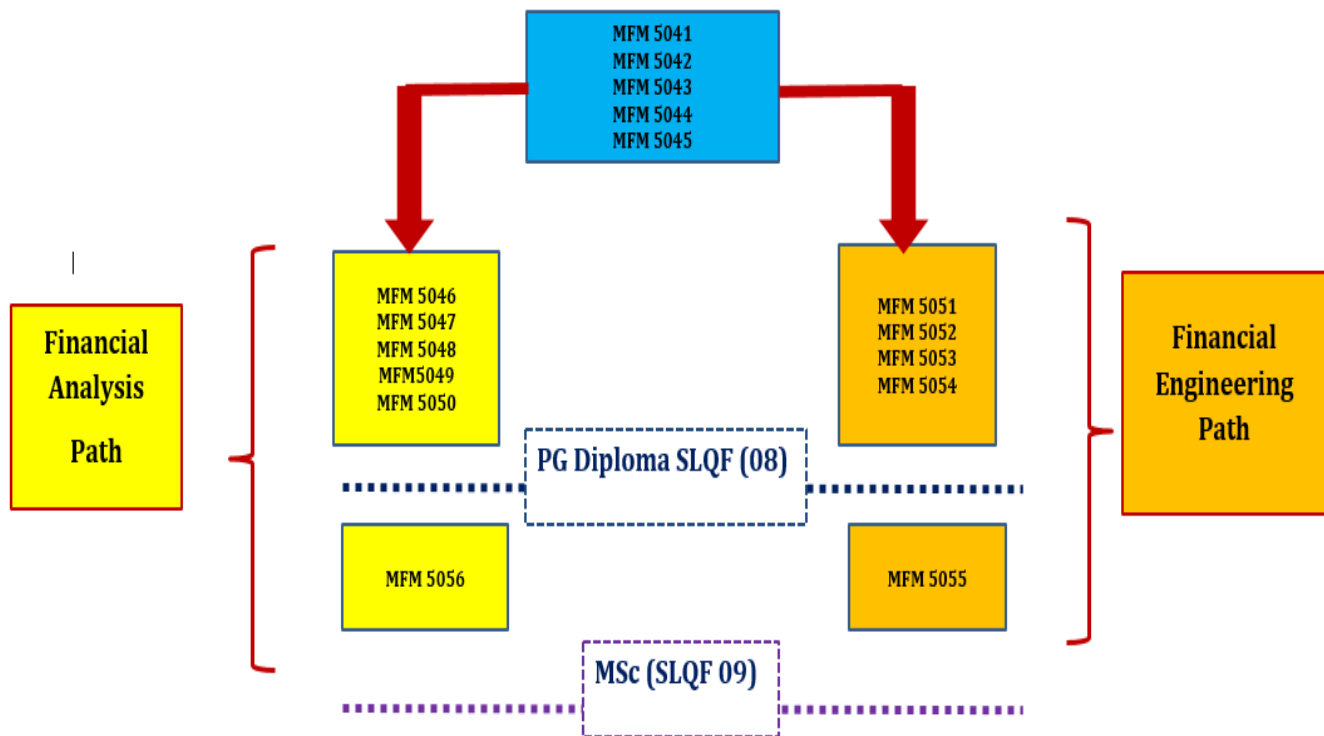
- **Financial Engineering (FE)**
- **Financial Analysis (FA)**

Financial Analysis is focused more towards qualitative aspects, and Financial Engineering is focused on deeper quantitative aspects. Both pathways require core concepts and tools of financial mathematics in the areas of finance, applied mathematics, statistics and computer science. They form the common set of courses delivered in semester I. The split into the two pathways is introduced in semester II based on student demand. In semester III, a related industry project is introduced to strengthen the acquired knowledge in the industry setting.

Programme Intended Learning Outcomes (PLO)

The end of the two years (**SLQF Level 9**) MSc in Financial Mathematics Degree holders should be able to:

- **PLO I:** demonstrate knowledge and proficiency in the terminologies, theories, concepts, practices and skills specific to the field of finance, financial instruments, financial markets and financial product development.
- **PLO II:** display critical awareness of current local/global financial issues/environments
- **PLO III:** observe and interpret financial markets to uncover potential opportunities and construct financial portfolios.
- **PLO IV:** apply best practices in financial product development / analysis to make plans, organize projects, monitor outcomes and provide financial leadership.
- **PLO V:** apply the Standards of Practice and Codes of Conduct of Financial Practitioners to address ethical challenges within the business environment and demonstrate intellectual maturity in a global setting.
- **PLO VI:** practice professionalism and uphold ethical standards and improve/update skills required for employment and life-long learning.
- **PLO VII:** effectively communicate & disseminate knowledge, information and ideas to specialist and a wider society
- **PLO VIII:** perform independently as well as interdependently
- **PLO IX:** demonstrate self-direction and originality in tackling and solving problems and be able to plan and implement tasks at professional levels



PART I: PG Diploma

Course Code	Course Title	Details	Notional hours	FA	FE
Semester I					
MFM 5041	Applied Finance	30L, 30P, 3C	150	X	X
MFM 5042	Optimization Methods for Finance	30L, 30P, 3C	150	X	X
MFM 5043	Financial Products & Pricing	30L, 30P, 3C	150	X	X
MFM 5044	Computing for Finance	60P, 2C	100	X	X
MFM 5045	Case Study on Financial Markets	90P, 3C	150	X	X
Semester II					
MFM 5046	Corporate Finance	30L, 2C	100	X	
MFM 5047	Financial Risk Management	30L, 2C	100	X	
MFM 5048	Economics for Finance	30L, 2C	100	X	
MFM 5049	Financial Reporting and Analysis	30L, 2C	100	X	
MFM 5050	Quantitative Methods in Finance	30L, 30P, 3C	150	X	
MFM 5051	Investment Analysis	30L, 30P, 3C	150		X
MFM 5052	Quantitative Risk Analysis	30L, 30P, 3C	150		X
MFM 5053	Financial Econometrics	30L, 30P, 3C	150		X
MFM 5054	Computational Models in Financial Engineering	60P, 2C	100		X
	TOTAL NOTIONAL HOURS (PG Diploma) – SLQF Level 8			1250	1250
	TOTAL CREDITS (PG Diploma) - SLQF Level 8			25C	25C

PART II: MSc Coursework

Course Code	Course Title	Details	Notional hours	FA	FE
Semester III					
MFM 5055	Quantitative Finance Project	150P, 5C	500		X
MFM 5056	Financial Analysis Project	150P, 5C	500	X	
	TOTAL NOTIONAL HOURS (MSc) - SLQF Level 9			1750	1750
	TOTAL CREDITS (MSc Coursework) - SLQF Level 9			30C	30C

Module Details

Course Code	MFM 5041			
Course Name	Applied Finance			
Credit Value	3			
Core/ Optional	Core			
Prerequisites	None			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	30 H	30 H	90 H	150 H
Course Aim	This course explores the theoretical aspects of finance and valuation of money and provides applications			
Intended Learning Outcomes	<p>At the successful completion of this course, students should be able to</p> <ul style="list-style-type: none"> • CLO1: <i>identify</i> and <i>apply</i> basics valuation methods and <i>compute</i> time value • CLO2: <i>value</i> the different cash flows • CLO3: <i>apply</i> techniques to <i>price</i> the financial instrument • CLO4: <i>use</i> techniques to <i>compare</i> different cash flows 			
Course Content	The effective rate of interest, the real rate of interest, the force of interest, nominal rates of interest, the rate of discount, the principle of equivalence, level cash series, Recursive relations, accumulations, deferred and conventional level cash series, more general level cash series, valuing simple projects, financial instrument and their behavioral properties, fund analysis, Money weighted rate and Time weighted rate, Excel financial functions and their applications.			
Teaching/ Learning Methods	Lectures, Tutorial Discussions, Practical Sessions, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, VLE, Group Activities, Independent Learning Activities			
Method/s of Evaluation	Continuous Assessment 40%		Final Assessment 60 %	
	Quizzes (CLO 1,2,3) In class examination (CLO 1,2,3), practical examination (CLO 4), Mid Sem. Examinations (CLO 1, 2,3,4)		Theory 40%	Practical 20% Others
Recommended Reading	<ol style="list-style-type: none"> 1. Ross, SA, Westerfield, RW, Jordan, BD, (2002), Fundamentals of Corporate Finance, 8th edition, McGraw-Hill Publishing Company. 2. Kellison, SG, (2008), The Theory on Interest, 6th Edition, Richard D. Irwin Inc. 3. Marek Capinski and Tomasz Zastawniak (2003), Mathematics for Finance, An introduction to Financial Engineering, Springer-Verlag London Limited. 			

Course Code	MFM 5042			
Course Name	Optimization Methods for Finance			
Credit Value	3			
Core/ Optional	Core			
Prerequisites	None			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	30 H	30 H	90 H	150 H
Course Aim	Optimization models and methods play an increasingly important role in financial decisions. This course introduces the approach of modeling financial decisions as optimization problems and then developing appropriate optimization methodologies to solve these problems.			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none"> • CLO1: <i>model</i> financial optimization problems • CLO2: <i>interpret</i> models as mathematical programs • CLO3: <i>analyze</i> mathematical programs using optimization methodology and software • CLO4: <i>use</i> analysis to gain insight and <i>make</i> decisions 			
Course Content	Linear Optimization: Linear Programming, Linear programming problem, duality, optimality conditions, short review on simplex method. LP models: Asset/liability cash-flow matching, short-term financing, dedication, sensitivity analysis for LP, case studies on constructing a dedicated portfolio. LP models: Asset pricing and arbitrage, derivative securities and fundamental theorem of asset pricing, arbitrage detection using LP. Nonlinear Optimization: Nonlinear Programming, univariate optimization, unconstrained optimization and constrained optimization, quadratic programming for portfolio optimization.			
Teaching/ Learning Methods	Lectures, Tutorial Discussions, Practical Sessions, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, VLE, Group Activities, Independent Learning Activities			
Method/s of Evaluation	Continuous Assessment 40%		End of semester examination 60%	
	Quizzes (CLO 1,2,3) In class examination (CLO 1,2,3,4), practical examination (CLO 3,4), Mid Sem. Examinations (CLO 1, 2,3,4)		Theory 50%	Practical 10% Others -
Recommended Reading	<ol style="list-style-type: none"> 1. Gerard Cornuejols, Reha Tutuncu (2007), Optimization Methods in Finance, Cambridge University Press. 2. Taha HA (2017), Operations Research, 10th Editions, Pearson-Prentice Hall. 3. Winston WL, Venkataramanan V (2003), Introduction to Mathematical Programming, 4th Edition, Brooks/Cole, Cengage Learning. 			

Course Code	MFM 5043			
Course Name	Financial Products & Pricing			
Credit Value	3			
Core/ Optional	Core			
Prerequisites	None			
Hourly Breakdown	Lectures	Practical	Independent Learning	
	30 H	30 H	90 H	
Notional Hours	150 H			
Course Aim	This course explores financial products of the modern financial market and the mathematical techniques for product price calculation.			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none">● CLO1: <i>identify</i> financial products and <i>value</i> them● CLO2: <i>apply</i> techniques to <i>value</i> the products● CLO3: <i>design</i> financial products for risk market			
Course Content	Introduction to derivatives, complete market, Market risk and credit risks in the use of derivatives. American and European options, Types of Trades, Hedgers, Speculators and arbitrageurs, Hedging with derivatives, Factors affecting option prices, Strategies with options, Boundaries with options, One-step Binomial Models, Risk Neutral valuation, Two-Step Binomial trees, Black Scholes model, Distribution of returns, volatility, risk neutral pricing, Black-Scholes-Merton differential equation. Estimating volatility using historical data, implied volatility, Exotic and path dependent options Forward and Future Contracts, Futures and forward pricing, Hedging with futures, Options on stock indices, currencies and futures, evaluation of future options using a binomial tree, Options on stock indices, currencies and futures			
Teaching/ Learning Methods	Lectures, Tutorial Discussions, Practical Sessions, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, VLE, Group Activities, Independent Learning Activities			
Method/s of Evaluation	Continuous Assessment 40 %		End of semester examination 60%	
	Quizzes (CLO 1,2) In class examination (CLO 1,2,3), practical examination (CLO 2,3), Mid Sem. Examinations (CLO 1, 2,3)		Theory 40%	Practical 20% Others -
Recommended Reading	1. Hull John, (2008), Options, futures and other derivatives, International 7th Edn, Pearson Prentice Hall. 2. Ross S. (2003), Introduction to Mathematical Finance, Cambridge University Press. 3. Marek Capinski, Tomasz Zastawniak (2011), Mathematics for Finance: An Introduction to Financial Engineering, Springer.			

Course Code	MFM 5044			
Course Name	Computing for Finance			
Credit Value	2			
Core/ Optional	Core			
Prerequisites	None			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	None	60 H	40 H	100 H
Course Aim	This course explores the practical application of electronic spreadsheets in the aspect of financial mathematics.			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none"> • CLO1: <i>identify</i> spreadsheet tools and techniques for financial computation • CLO2: <i>apply</i> said tools and <i>solve</i> financial problems • CLO3: <i>write</i> macro programs and <i>model</i> the financial computation 			
Course Content	Introduction to formulas for understanding basic spreadsheets build-in functions, Functions for financial calculations and decisions. Do sensitivity analysis with data tables in spreadsheet applications, Summarizing and visualizing data using build-in functions and pivot tables, understanding correlations and summary relationships, to multiple regression tools in spreadsheets, Using Monte Carlo simulation in spreadsheet, Automating the tasks and Macro programming.			
Teaching/ Learning Methods	Lectures, Practical Classes, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, Group Assignments, Group Presentations , VLE, Independent Learning Activities			
Method/s of Evaluation:	Continuous Assessment 50 %		End of semester examination 50%	
	Practical Examinations (CLO 1,2,3), Quizzes (CLO 1,2), Case Studies (CLO 1,2,3)		Theory -	Practical 40% Oral 10%
Recommended Reading	1. Wayne L. Winston (2016), Excel 2016 Data Analysis and Business Modeling, Microsoft Press. 2. Bill Jelen and Tracy Syrstad (2010), VBA and Macros – Microsoft Excel 2010, Que Publishing.			

Course Code	MFM 5045			
Course Name	Case Study on Financial Market			
Credit Value	3			
Core/ Optional	Core			
Prerequisites	MFM 5041, MFM 5042, MFM 5043			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	30H	60 H	60 H	150 H
Course Aim	To provide the hands on experiences in the field of Financial Market			
Intended Learning Outcomes	<p>By the end of the course, students should be able to</p> <ul style="list-style-type: none"> ● CLO1: <i>apply</i> quantitative methods to real data ● CLO2: <i>analyze</i> scenarios and <i>judge</i> the current patterns ● CLO3: <i>prioritize</i> conditions and methods to <i>apply</i> different real cases ● CLO4: <i>value</i> the given situation based on available conditions / limitations ● CLO5: <i>communicate</i> and <i>present</i> findings ● CLO6: <i>write</i> a report 			
Course Content	Individual candidates will be assigned to a Case Study on Financial Market. Each student will be required to gain thorough knowledge on a given topic related to the financial market through a set of field visits/workshops under the guidance of an industrial expertise panel. After the given period of time, candidates are expected to conduct the seminar based on their case studies.			
Teaching/ Learning Methods	Workshops, Problem related Discussions (Quizzes, In-class Assessment Discussions), Group Case Studies, Group Presentations, Group Assignments, Group Discussions, VLE, Independent Learning Activities, Seminars			
Method/s of Evaluation:	Continuous Assessment 50 %		End of semester examination 50%	
	Group Case Study, Quizzes, Group Presentation, Reports		Presentation 10%	Viva 25% Report 15%
Recommended Reading	<ol style="list-style-type: none"> 1. Chiradeep Chatterjee (2008), Case Studies on Financial Markets, The Institute of Chartered Financial Analysts of India. 2. Tarika Sikarwar (2017), A Handbook of Case Studies in Finance, Cambridge Scholars Publishing 3. Robert F. Bruner, Kenneth Eades, Michael Schill (2009), Case Studies in Finance, McGraw-Hill Higher Education. 			

Course Code	MFM 5046			
Course Name	Corporate Finance			
Credit Value	2			
Core/Optional	Core			
Prerequisites	MFM 5041, MFM 5043			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	30 H	15 H	55 H	100 H
Course Aim	This course explores the theoretical aspects of finance and valuation of money and provides applications			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none"> • CLO1: <i>compute</i> the cost of capital and <i>analyze</i> practical applications • CLO2: <i>value</i> the taxation of the company • CLO3: <i>apply</i> techniques to <i>price</i> the projects • CLO4: <i>value</i> financial products 			
Course Content	Introduction of Corporate finance and financial manager, the goal of the financial management, Stock valuation, Capital budgeting, Capital structure, cost of capital, dividend policy, personal and corporation taxation, Project analysis and evaluation, Return risk and the security market line, short/long term financing, Measures and assessment of financial performance.			
Teaching/ Learning Methods	Lectures, Practical Sessions, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, Group discussions			
Method/s of Evaluation:	Continuous Assessment 40 %	End of semester examination 60%		
	Quizzes (CLO 1,2,3,4), In class examination (CLO 1,2,3,4), practical examination (CLO 3,4), Mid Sem. Examinations (CLO 1, 2,3,4)	Theory 40%	Practical 10%	Oral 10%
Recommended Reading	<ol style="list-style-type: none"> 1. Ross, SA, Westerfield, RW, Jordan, BD, (2002), Fundamentals of Corporate Finance, 8th edition, McGraw-Hill Publishing Company. 2. Kellison, SG, (2008), The Theory on Interest, 6th Edition, Richard D. Irwin Inc. 3. Marek Capinski and Tomasz Zastawniak (2003), Mathematics for Finance, An introduction to Financial Engineering, Springer-Verlag London Limited. 			

Course Code	MFM 5047			
Course Name	Financial Risk Management			
Credit Value	2			
Core/ Optional	Core			
Prerequisites	MFM 5041, MFM 5043			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	30 H	15 H	55 H	100 H
Course Aim	This course explores financial risk management techniques and their applications into financial markets and instruments			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none"> • CLO1: <i>identify</i> and <i>compute</i> financial risk • CLO2: <i>apply</i> suitable risk measures • CLO3: <i>quantify</i> financial risk and <i>make</i> decisions 			
Course Content	Introduction to Risk, Fixed income risk, duration and convexity, Markowitz risk- return approach for asset allocation of a portfolios, Efficient frontier, Risk Measures: Value at Risk (VaR), Conditional Value at Risk (CVaR): Parametric, Historical simulation, Portfolio analysis and measurements of risk. Equity portfolio risk management via option strategies.			
Teaching/ Learning Methods	Lectures, Practical Sessions, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, Group Discussions			
Method/s of Evaluation:	Continuous Assessment 40 %		End of semester examination 60%	
	Quizzes (CLO 1,2) In class examination (CLO 1,2,3), practical examination (CLO 1,2,3), Mid Sem. Examinations (CLO 1, 2,3)	Theory 40%	Practical 20%	Others -
Recommended Reading	1. Philippe Jorion (2009), Financial Risk Manager Handbook (GARP (Global Association of Risk Professionals)), John Wiley & Sons. 2. Steven Allen (2003), Financial Risk Management: A Practitioner's Guide to Managing Market and Credit Risk, John Wiley & Sons, Ins			

Course Code	MFM 5048			
Course Name	Economics for Finance			
Credit Value	2			
Core/ Optional	Optional			
Prerequisites	None			
Hourly Breakdown	Lectures	Practical	Independent Learning	
	30 H	15 H	55 H	
			Notional Hours	
			100 H	
Course Aim	To provide the advanced knowledge in Economic models, methods those are essential for economic analysis and economic problem solving			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none">● CLO1: <i>identify</i> the function of market and prices as allocated mechanisms● CLO2: <i>apply</i> the concept of equilibrium to both microeconomics and macroeconomics● CLO3: <i>discuss</i> and <i>analyze</i> the application of marginal analysis● CLO4: <i>assess</i> the role of the factor market in determining the allocation of resources● CLO5: <i>compare</i> the limits of economic analysis <i>judge</i> said limit			
Course Content	The basic theory of individual choice, Contingent commodities , Insurance and Expected utility, The firm and its goal, Production and costs, perfect competition when firms have identical cost and non-identical costs, the basic monopoly model and regulatory responses to monopoly, price discrimination, Oligopoly models: cournot model, stackelberg and Bertrand, Demand and supply for factors and equilibrium in the factor market, Monopsony and monopoly in the factor market, Inter temporal consumption and production, Investment decision and Present value, Pareto efficiency and market failure, Adverse selection, moral hazard , signaling and screening, Externalities, Public goods Macroeconomics: IS-LM Model, Unemployment, AD- AS, Inflation, Phillips curve, Economic growth, Solow model, Exogenous and endogenous growth theories, open economy, mundel-flemming model, Theories of consumption, investment, Money demand and Money supply, Monetary and Fiscal Policy			
Teaching/ Learning Methods	Lectures, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, Group Discussions, Group Presentations			
Method/s of Evaluation:	Continuous Assessment 40 %		End of semester examination 60%	
	Quizzes (CLO 1,2,3) In class examination (CLO 1,2,3,4,5), Case Studies (CLO 1,2,3,4,5), Mid Sem. Examinations (CLO 1, 2,3,4,5)	Theory 40%	Practical -	Oral 20%
Recommended Reading	1. Katz, ML, Rosen, HS (2005), Microeconomics, McGraw-Hill Education 2. Mankiw, NG (2010), Macroeconomics, Worth Publishers, NY.			

Course Code	MFM 5049			
Course Name	Financial Reporting and Analysis			
Credit Value	2			
Core/Optional	Optional			
Prerequisites	None			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	30 H	15 H	55 H	100 H
Course Aim	This course explores the theoretical underpinnings and practical application of financial statement analysis.			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none"> • CLO1: <i>discuss</i> the importance of financial statement analysis to user groups • CLO2: <i>identify</i> the basic components of each of the financial statements • CLO3: <i>identify</i> and <i>apply</i> the appropriate techniques of financial statement analysis • CLO4: <i>interpret</i> the results obtained during basic analysis stage 			
Course Content	Financial statements and the components, Accounting principles, Importance and limitations of financial statement analysis, Uses and user groups, Sources of information, Tools and techniques of financial statement analysis, Financial statement irregularities			
Teaching/ Learning Methods	Lectures, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, Group discussions, Group Assignments			
Method/s of Evaluation:	Continuous Assessment 40 %	End of semester examination 60%		
	Quizzes (CLO 1,2,3) Case Studies (CLO 1,2,3,4) Mid Sem. Examinations (CLO 1, 2,3,4)	Theory 50%	Practical -	Oral 10%
Recommended Reading	<ol style="list-style-type: none"> 1. Temte, A., Temte, A. (2003). Financial Statement Analysis. Chicago: Dearborn Trade, A Kaplan Professional Company. 2. Fridson, M., Alvarez, F. (2011). Financial statement analysis: a practitioner's guide, fourth edition (4th ed.). Hoboken, N.J: John Wiley & Sons. 			

Course Code	MFM 5050 Quantitative Methods in Finance			
Course Name	Quantitative Methods in Finance			
Credit Value	3			
Core/ Optional	Core			
Prerequisites	None			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	30 H	30 H	90 H	150 H
Course Aim	This course provides the probability and statistical methods to model finance and to draw quantitative financial discussions.			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none"> • CLO1: <i>discuss</i> basic probability theory • CLO2: <i>define</i> random variables and <i>solve</i> univariate and multivariate probability problems • CLO3: <i>apply</i> the concepts of expectation, variance, covariance and correlation to <i>solve</i> problems • CLO4: <i>use</i> methods in statistical inference to <i>solve</i> financial problems 			
Course Content	Basic statistics and probability theory, random variables, univariate and multivariate probability distributions-continuous and discrete, expectation-conditional and unconditional, variance, covariance, variance-covariance matrices, correlation, random matrices, sampling and estimation, confidence intervals, F-test, t-Test, Chi-Squared Test, Hypothesis testing and ANOVA, MATLAB and Excel functions to solve probabilistic problems in finance			
Teaching/ Learning Methods	Lectures, Practical Sessions, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, Group Discussions, Seminars			
Method/s of Evaluation:	Continuous Assessment 40 %		End of semester examination 60%	
	Quizzes (CLO 1,2,3) In class examination (CLO 1,2,3,4), Practical examination (CLO 3,4), Mid Sem. Examinations (CLO 1, 2,3,4)	Theory 30%	Practical 30%	Others -
Recommended Reading	<ol style="list-style-type: none"> 1. Sheldon M. Rose (2014), Introduction to Probability and Statistics for Engineers and Scientists, Fifth Edition, Elsevier. 2. Alan J. Izenman (2008), Modern Multivariate Statistical Techniques, Springer. 3. Jay L. Devore and Kenneth N. Berk (2012), Modern Mathematical Statistics with Applications, Springer. 			

Course Code	MFM 5051			
Course Name	Investment Analysis			
Credit Value	3			
Core/ Optional	Core			
Prerequisites	MFM 5041, MFM 5043			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	30 H	30 H	90 H	150 H
Course Aim	This course provides basic concepts of financial decision making techniques			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none"> • CLO1: <i>compute</i> and <i>analyze</i> the impact of interest rate variation. • CLO2: <i>compute</i> the bond price and <i>analyze</i> variability • CLO3: <i>apply</i> the valuation methods and <i>judge</i> the feasibility of the given project 			
Course Content	Introduction to financial analysis, pricing a bond and sensitivity of it, zero coupon bonds and their features, par yield, spot rates, forward rates, term structure of the interest rate, yield rate, duration and convexity of the bond, fund analysis, valuing real cash flows, valuing random cash flows, Excel computation and solvers.			
Teaching/ Learning Methods	Lectures, Practical Sessions, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, Group Discussions, Workshops, Seminars			
Method/s of Evaluation:	Continuous Assessment 40 %	End of semester examination 60%		
	Quizzes (CLO 1,2,3) In class examination (CLO 1,2,3), Practical examination (CLO 1,2,3), Mid Sem. Examinations (CLO 1, 2,3)	Theory 40%	Practical 20%	Others -
Recommended Reading	<ol style="list-style-type: none"> 1. R Stephen G. Kellison (2009), The Theory of Interest, 3rd Edition, McGraw-Hill Irwin. 2. Perry H. Beaumont (2004), Financial Engineering Principles: A Unified Theory for Financial Product Analysis and Valuation, John Wiley & Sons, Inc. 3. Marek Capinski & Tomasz Zastawniak (2003), Mathematics for Finance: An Introduction to Financial Engineering, Springer. 			

Course Code	MFM 5052			
Course Name	Quantitative Risk Analysis			
Credit Value	3			
Core/ Optional	Core			
Prerequisites	MFM 5041, MFM 5043			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	30 H	30 H	90 H	150 H
Course Aim	This course provides basic concepts of financial decision making techniques			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none"> • CLO1: <i>compute</i> financial risk • CLO2: <i>value</i> suitable risk measures • CLO3: <i>model</i> and <i>quantify</i> financial risk • CLO4: <i>quantify</i> credit risk • CLO5: <i>model</i> operational risk 			
Course Content	Introduction to risk, financial risk, credit risk and operational risk, Risk measures, Risk return tradeoff. Risk modelling and quantification. Fixed income, equity and option market risk analysis and strategies, Yield curve and forward curve modelling, duration and convexity, Value at Risk: Parametric approach, historical simulation and monte-carlo simulation. Credit Risk Modelling: Altman's model and Application of credit Matrix approach. Operational Risk: Basel II (Basel-II) framework.			
Teaching/ Learning Methods	Lectures, Practical Sessions, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, Group Discussions, Seminars			
Method/s of Evaluation:	Continuous Assessment 40 %		End of semester examination 60%	
	Quizzes (CLO 1,2,3) In class examination (CLO 1,2,3,4), Practical examination (CLO 3,4,5), Mid Sem. Examinations (CLO 1, 2,3,4,5)		Theory 40%	Practical 20% Others -
Recommended Reading	1. Donald R. Van Deventer, Kenji Imai, Mark Mesler (2014), Advanced Financial Risk Management, John Wiley & Sons, Ins. 2. Philippe Jorion (2009), Financial Risk Manager Handbook (GARP (Global Association of Risk Professionals)), John Wiley & Sons. 3. Steven Allen (2003), Financial Risk Management: A Practitioner's Guide to Managing Market and Credit Risk, John Wiley & Sons, Ins.			

Course Code	MFM 5053			
Course Name	Financial Econometrics			
Credit Value	3			
Core/ Optional	Core			
Prerequisites	None			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	30 H	30 H	90 H	150 H
Course Aim	This course provides basic concepts of financial decision making techniques			
Intended Learning Outcomes	By the end of the course, students should be able to <ul style="list-style-type: none"> • CLO1: <i>estimate</i> linear relationships among financial variables and <i>derive</i> conclusions based on estimated models • CLO2: <i>model</i> and <i>forecast</i> univariate and multivariate financial time series • CLO3: <i>model</i> and <i>forecast</i> financial volatility 			
Course Content	Statistical Properties of Financial Returns, Regression analysis and Applications in Finance, Maximum Likelihood Estimation, Univariate Time Series and Applications to Finance, Vector Autoregressive Models and Cointegration, Modelling Volatility – Conditional Heteroscedastic Models, Modelling Volatility and Correlations – Multivariate GARCH Models.			
Teaching/ Learning Methods	Lectures, Practical Sessions, Problem related Discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, Group Discussions, Seminars, Workshops			
Method/s of Evaluation:	Continuous Assessment 40 %	End of semester examination 60%		
	Quizzes (CLO 1,2,3) In class examination (CLO 1,2,3), Practical examination (CLO 1,2,3), Mid Sem. Examinations (CLO 1, 2,3)	Theory 30%	Practical 30%	Others -
Recommended Reading	1. Brooks, C (2019), Introductory Econometrics for Finance, 4th Edition, Cambridge University Press. 2. Alexander, C. (2001). Market Models: A Guide to Financial Data Analysis. John, Wiley & Sons.			

Course Code	MFM 5054			
Course Name	Computational Models in Financial Engineering			
Credit Value	2			
Core/ Optional	Optional			
Prerequisites	MFM 5044			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	None	60 H	40 H	100 H
Course Aim	This course provides theoretical and practical knowledge, on building and using, computational models based on soft programming techniques			
Intended Learning Outcomes	<p>By the end of the course, students should be able to</p> <ul style="list-style-type: none"> • CLO1: <i>compare</i> hard computing methods with soft computing methods and <i>choose</i> the appropriate method for solving a given problem • CLO2: <i>describe</i> theoretical aspect of Artificial Neural Networks (ANN) their advantages and limitations • CLO3: <i>implement</i> a simple Feed Forward Network in Excel and Python or similar software and <i>use</i> ANN to <i>solve</i> real world classification and prediction problems • CLO4: <i>describe</i> how Genetic Algorithms (GA) functions and <i>implement</i> a GA program to <i>solve</i> optimization problems • CLO5: <i>use</i> Monte-Carlo simulations to <i>solve</i> appropriate problems 			
Course Content	Introduction to Python programming, Introduction to Artificial Neural Networks (ANN), Single Layer Networks, Multilayer Networks, Different learning rules, Advantages and limitations of ANN. Preprocessing and post processing of data, Using ANN to solve real world problems, Introduction to Genetic Algorithms (GA) with advantages, disadvantages and limitations, Encoding data to genes, Cross overs, mutations and other generation creation techniques, Different selection methods, Solving TSP and knapsack problems, Using ML to implement GA to solve problems, Different hybrid mechanism, Implement a GA ANN hybrid, Advantages of a hybrid, Introduction to Monte Carlo simulations (MC), its applications, Using Python to implement a MC to model real world problems			
Teaching/ Learning Methods	Lectures, Practical Sessions, Problem related discussions (Quizzes, In-class Assessment Discussions), Case Studies, Presentations, Group assignments, Group presentations, Workshops, Seminars, Report writing			
Method/s of Evaluation:	Continuous Assessment 50 %		End of semester examination 50%	
	Practical Examinations (CLO 1,2,3,4,5), Quizzes (CLO 1,2,3,4,5), Case Studies (CLO 1,2,3,4,5)	Theory 20%	Practical 20%	Oral 10%
Recommended Reading	<ol style="list-style-type: none"> 1. Kevin L. Priddy, Paul E. Keller (2005), Artificial Neural Networks: An Introduction, SPIE Publications. 2. Zbigniew Michalewicz (2009), Genetic Algorithms + Data Structures = Evolution Programs, Springer-Verlag Berlin Heidelberg 3. Randy L. Haupt, Sue Ellen Haupt (2004), Practical Genetic Algorithms, Wiley-Interscience 			

Course Code	MFM 5055			
Course Name	Quantitative Finance Project			
Credit Value	5			
Core/ Optional	Core			
Prerequisites	None			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	20 H	30 H	450 H	500 H
Course Aim	This course provides opportunities to utilize gained theoretical/practical knowledge and experiences to solve real quantitative finance problems in real environment settings			
Intended Learning Outcomes	<p>By the end of the course, students should be able to</p> <ul style="list-style-type: none"> • CLO1: <i>design</i> models to <i>quantify</i> future behavior • CLO2: <i>modify</i> existing models appropriately • CLO3: <i>develop</i> simulation models to <i>demonstrate</i> financial behavior • CLO4: <i>collaborate</i> with existing models/methods • CLO5: <i>write</i> reports to <i>demonstrate</i> models and their features • CLO6: <i>develop</i> effective presentations 			
Course Content	<p>Individual candidates will be assigned guided study on quantitative finance topics. Each student will be required to study/develop/modify model/s and simulation technique/s on a given topic related to quantitative finance under the guidance of a supervisor and or industrial mentor appointed by the department.</p> <p>After the given six months period of time, candidates are expected to conduct the four seminars (proposal / literature / methodology / basic results) in each six weeks' time based on their studies. The end of the period students are supposed to submit reports according to given guidelines and make final presentations.</p>			
Teaching/ Learning Methods	Workshops, Individual Discussions, Group Discussions, Presentations, Viva, Report Writing, Seminars,			
Method/s of Evaluation:	Continuous Assessment 30%	End of semester examination 70%		
	Presentations, Discussions, Reports	Report 25%	Final Presentation 20%	Viva 25%
Recommended Reading	<ol style="list-style-type: none"> 1. Scott P. Mason, Robert C. Merton, Andre F. Perold, Peter Tufano (2005), Cases in Financial Engineering: Applied Studies of Financial Innovation, Prentice Hall. 2. Gianluca Fusai, Andrea Roncoroni (2008), Implementing Models in Quantitative Finance: Methods and Cases (Springer Finance), Springer-Verlag Berlin Heidelberg 3. Wolfgang Härdle, Cathy Yi-Hsuan Chen, Ludger Overbeck (2017), Applied Quantitative Finance, Springer-Verlag Berlin Heidelberg 			

Course Code	MFM 5056			
Course Name	Financial Analysis Project			
Credit Value	5			
Core/ Optional	Core			
Prerequisites	None			
Hourly Breakdown	Lectures	Practical	Independent Learning	Notional Hours
	20 H	30 H	450 H	500 H
Course Aim	This course provides opportunities to utilize gained theoretical/practical knowledge and experiences to analysis financial situations in real settings			
Intended Learning Outcomes	<p>By the end of the course, students should be able to</p> <ul style="list-style-type: none"> ● CLO1: <i>design</i> the analysis tools to <i>quantify</i> current behavior ● CLO2: <i>modify</i> existing analyzing tools appropriately ● CLO3: <i>develop</i> simulation models to <i>demonstrate</i> financial behavior ● CLO4: <i>collaborate</i> with existing financial tools ● CLO5: <i>write</i> reports to <i>demonstrate</i> analysis tools and their features ● CLO6: <i>develop</i> effective presentations 			
Course Content	<p>Individual candidates will be assigned guided study on financial analysis topics. Each student will be required to study/develop/modify analysis tools and simulation technique/s on a given topic related to financial analysis under the guidance of a supervisor and or industrial mentor appointed by the department.</p> <p>After the given six months period of time, candidates are expected to conduct the four seminars (proposal / literature / methodology / basic results) in each six weeks' time based on their studies. The end of the period students are supposed to submit reports according to given guidelines and make final presentations.</p>			
Teaching/ Learning Methods	Workshops, Individual Discussions, Group Discussions, Presentations, Viva, Report Writing			
Method/s of Evaluation:	Continuous Assessment 30%	End of semester examination 70%		
	Presentations, Discussions, Reports	Report 25%	Final Presentation 20%	Viva 25%
Recommended Reading	<ol style="list-style-type: none"> 1. Harold Bierman Jr (Cornell) (2017), Case Studies for Corporate Finance, World Scientific. 2. K. MidgleyR. G. Burns (2015),Case Studies in Business Finance and Financial Analysis, Springer 			

Table 2: SLQF Outcomes | Programme ILOs (PLO) Vs Courses

SLQF outcomes	Subject / Theoretical Knowledge	Practical Knowledge and Application	Communication	Teamwork and Leadership	Creativity and Problem Solving	Managerial and Entrepreneurship	Information Usage and Management	Networking and Social Skills	Adaptability and Flexibility	Attitudes, Values and Professionalism	Vision for Life	Updating Self / Lifelong Learning
Program ILOs	PLO 1, PLO2, PLO3, PLO4, PLO9	PLO 1, PLO2, PLO3, PLO4, PLO9	PLO7, PLO9	PLO4, PLO8, PLO9	PLO3, PLO4, PLO9	PLO4, PLO7, PLO9	PLO3, PLO9	PLO4, PLO8, PLO9	PLO3, PLO9	PLO1, PLO2, PLO5, PLO6, PLO9	PLO2, PLO5, PLO6, PLO9	PLO2, PLO5, PLO6, PLO8, PLO9
MFM 5041	H	H	H	L	H	L	H	H	M	M	L	L
MFM 5042	H	H	H	L	H	L	H	H	M	M	L	L
MFM 5043	H	H	H	L	H	L	H	H	M	M	L	L
MFM 5044	H	H	H	L	H	L	H	H	M	M	L	L
MFM 5045	H	H	H	H	H	H	H	H	H	H	H	H
MFM 5046	H	H	H	L	H	L	H	H	M	M	L	L
MFM 5047	H	H	H	L	H	L	H	H	M	M	L	L
MFM 5048	H	H	H	L	H	L	H	H	M	M	L	L
MFM 5049	H	H	H	H	H	H	H	H	M	M	L	L
MFM 5050	H	H	H	L	H	L	H	H	M	M	L	L
MFM 5051	H	H	H	L	H	L	H	H	M	M	L	L
MFM 5052	H	H	H	H	H	H	H	H	M	M	L	L
MFM 5053	H	H	H	L	H	L	H	H	M	M	L	L
MFM 5054	H	H	H	H	H	H	H	H	H	H	H	H
MFM 5055	H	H	H	H	H	H	H	H	H	H	H	H
MFM 5056	H	H	H	H	H	H	H	H	H	H	H	H

H	Highly correlated
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M	Moderately correlated
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L	Correlated
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Table 3: Categories of Learning Outcomes (SLQF)

No	Categories of Learning Outcomes	Core Area
1	Subject / Theoretical Knowledge	Knowledge
2	Practical Knowledge and Application	
3	Communication	Skills
4	Teamwork and Leadership	
5	Creativity and Problem Solving	
6	Managerial and Entrepreneurship	
7	Information Usage and Management	
8	Networking and Social Skills	
9	Adaptability and Flexibility	Attitudes, Values, Professionalism and Vision for life
10	Attitudes, Values and Professionalism	
11	Vision for Life	
12	Updating Self / Lifelong Learning	Mind-set and Paradigm

General Guidelines

The Programme

MSc programmes shall have a minimum of **30** credits from the two components; **Part I and Part II**.

Part I

Part I shall consist of theory, laboratory and field work. **In total, Part I** shall consist of a minimum of 25 credits and is equivalent to **Level 8 of the SLQF** (Sri Lanka Quality Framework).

Part II

To proceed to **Part II** students should achieve a **minimum GPA of 3.00 in Part I**.

Part II shall carry a minimum of 5 credits and shall consist of a mini research project, or component(s) equivalent to such. Part II Students undertaking a mini research project are required to carry out research at an academic/research/industrial institution where necessary facilities are available and submit a report on the research carried out. Parts I and II combined containing a minimum of 30 Credits is equivalent to Level 9 of the SLQF (Sri Lanka Quality Framework).

Duration

The duration of the programme will be 24 months. **Part I** shall be conducted usually in the first year of the programme over 2 semesters. **Part II** shall be of 6-12 months duration.

The courses are offered during weekdays and/or weekends. However in carrying out the research project continuous attendance may be necessary during regular working hours of the week.

The maximum period allowed to complete the degree is 05 years from the date of the first registration.

Registration Procedure

Date of Registration

A person who has been selected as a postgraduate student shall be required to register for the current academic year to follow the particular MSc programme. The date of registration shall be specified by the Faculty.

Maintenance of Registration

Registration should be maintained in order to obtain the MSc degree by paying the specified fees.

Withdrawal of Registration

A student wishing to withdraw from the programme for which he/she is registered should do so in writing to the Dean, Faculty of Science. In all such withdrawals, adjustments of fees and refunds, if any, under special circumstances, shall be determined by the Faculty.

Postponement of Registration

A student who desires to postpone his/her registration should do so in writing to the Dean, Faculty of Science, giving reasons for and duration of postponement. Each such request shall be considered by the Faculty on the recommendation by the Higher Degrees Committee (HDC) and the relevant Department.

Cancellation of Registration

A registration may be canceled by the Faculty on the recommendation by the HDC and the relevant Department for inadequate academic progress, violation of rules and regulations of the University, failure to pay prescribed fees by the due dates, or any other reasons as decided by the Faculty.

Leave of Absence

Leave of absence may be granted on medical grounds or any other valid reasons acceptable to the Faculty.

Scheme of Evaluation

The Grade Point Average (GPA) shall be computed using grades assigned for all papers in Parts I and for Part II. The minimum grade a student should achieve to pass a paper/mini project/research component is B-.

Grade Points and GPA

The Grade Points will be assigned using the following table.

Marks Range	Grade	Grade Point
85 – 100	A+	4.00
70 – 84	A	4.00
65 – 69	A-	3.70
60 – 64	B+	3.30
55 – 59	B	3.00
50 – 54	B-	2.70
45 – 49	C+	2.30
40 – 44	C	2.00
35 – 39	C-	1.70
30 – 34	D+	1.00
25 – 29	D	1.00
00 – 24	E	0.00

If the Grade Point Average (GPA) of a student is required for any purpose, it shall be calculated using the following equation:

$$\text{GPA} = \sum w_i g_i / \sum w_i$$

Where, w_i = number of credit units for the i^{th} and g_i = grade points for the courses

The GPA is rounded to the second decimal place.

Any student who has not appeared for the evaluation of a course may be assigned a GPA of 0.00 Value for such for the purpose of calculating his/her GPA.

Repeat Examinations

If a candidate fails the examination he/she shall repeat the entire examination or the required part at the next first available opportunity. Candidates are allowed to repeat an examination paper only once.

Award of Degree of Master of Science

A student who obtains a GPA of **3.00** or above for Part II may be eligible for the award of the Degree of Master of Science, provided the student fulfills other requirements as prescribed.

No student shall be entitled to the award of the Degree of Master of Science unless he/she has satisfied all the prescribed requirements and he/she has supplicated for the award of the Masters Degree at the relevant Convocation of the University of Colombo.

Award of Postgraduate Diploma

Students who obtain a GPA of **2.70** or above for Part I may be eligible for the award of the Postgraduate Diploma, where applicable, and upon request, provided the student fulfills other requirements as prescribed.

Student Request Form – MSc/PG Diploma in Financial Mathematics

Name of student	Reg. No.	Signature														
	Email:	Mobile:														
Name of Programme		Department														
Date of Reg.	Reg. No.	Date of Request:														
<p>Nature of Request (Tick as appropriate)</p> <table border="1"> <tr> <td><input type="checkbox"/></td> <td>Deferment of registration</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Medical (for examinations) Course:</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Overseas Leave</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Repeat Examination Course:</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Fallback option PG Dip.: MSc:</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Extension (beyond the permitted period) Period:</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Other</td> </tr> </table>			<input type="checkbox"/>	Deferment of registration	<input type="checkbox"/>	Medical (for examinations) Course:	<input type="checkbox"/>	Overseas Leave	<input type="checkbox"/>	Repeat Examination Course:	<input type="checkbox"/>	Fallback option PG Dip.: MSc:	<input type="checkbox"/>	Extension (beyond the permitted period) Period:	<input type="checkbox"/>	Other
<input type="checkbox"/>	Deferment of registration															
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<input type="checkbox"/>	Overseas Leave															
<input type="checkbox"/>	Repeat Examination Course:															
<input type="checkbox"/>	Fallback option PG Dip.: MSc:															
<input type="checkbox"/>	Extension (beyond the permitted period) Period:															
<input type="checkbox"/>	Other															
<p>Observation of Coordinator</p>																
Name of Coordinator		Name of Head														
Signature:		Signature:														
Date:		Date:														