

Dr. Harisingh Gour Vishwavidyalaya, Sagar (M.P)
(A Central University)



DEPARTMENT OF BUSINESS MANAGEMENT

SYLLABUS

Of

Master of Business Administration in Algo Trading

2021

1. Introduction

Technology evolution is no exception in the stock market. It has become a necessity for a trader to learn the multidimensional approach to stock trading. Algorithmic trading is a process of the defined instructor to carry out trade orders. It uses computer programs to execute a trade at high speeds and volume based on different variables like price, timings, etc. It involves using computer coding to take enter and exit trades in the share market. It reduces the time to analyze and improves execution speed. The base of the instructions depends on distinct variables like price, quantity, timing, and other metrics. Before choosing the platform, an individual needs trading strategy that allows to make profits in the market. an individual can use technical analysis or fundamental analysis strategy or even a combination of strategies to define price action and can configure these strategies based on market trends, quantity, timeframe, and technical indicators.

MBA in Algorithmic Trading offered by Department of Business Management, Dr. Harisingh Vishwavidyalaya, revolutionises the way people approach the financial markets by empowering them with bleeding-edge education and technologies. This course helps beginners in share to start with Algo Trading. By the help of this, high quality learning experience and best-in-class courses geared towards a global audience in quantitative trading and investing is achieved and aims to bring institutional-grade tools and platforms to democratize systematic and quantitative trading.

The benefits of Algo trading include:

- A systematic method of trading
- Free from human errors
- Reduction in transaction costs
- Enables back-testing using real-time and historical data
- Simultaneous monitoring of multiple metrics
- Reduction in errors because of emotional and psychological effects

2. About the Program

The MBA in Algorithmic Trading offered by Department of Business Management, Dr. Harisingh Vishwavidyalaya provides the most comprehensive training for professionals looking to grow or planning to start their careers in the field of algorithmic and quantitative trading. It is a full-time master's program for beginners who want to learn how to create algorithmic trading strategies with or without programming knowledge in the live market. It focuses on aspiring traders towards a successful trading career, by focusing on derivatives, quantitative trading, electronic market making, trading related technology and risk management and also enhance the skill set of their workforce and help them develop quantitative trading skills. In this course, students will learn various practical ways to create a back-testing system for trading strategies in the live market. Other opportunities include practical training in designing and implementing advanced algorithmic trading strategies using popular and effective tools and platforms. It is the best course for intraday traders, day traders, and positional traders who want to execute multiple traders at the same time using the software.

The Program is built around a fully examined three core areas:

- Quantitative Techniques
- Programmatic Tools
- Financial Markets

This course will equip students with a comprehensive understanding of the rules that drive successful trading strategies and hedge funds, and delivers a grounded introduction to financial theory and behavioural finance. Over the course of two years, students will learn key principles established by the trained faculty to guide through the process of building and evaluating an algorithmic trading model. They will also discover what biases are present in the market and gain the ability to decide whether a fund is worth investing in, based on specific evaluation criteria.

3. Features

The MBA in Algorithmic Trading offered by Department of Business Management, Dr. Harisingh Vishwavidyalaya utilises a number of predefined rules that enable automation of the investment process, including identifying market efficiencies, recognising patterns, and making trades at a high frequency. Success in this arena relies

on an understanding of these rules, a knowledge of current and future trends and technologies, and a clearly defined trading strategy. The key features of the program are:

Practical Exposure: Acquire the knowledge and learn tools & techniques used by traders in the real world

Verified Certification: Verified certification with Prometric for students provides an edge to their profession.

Support: Dedicated Support Managers for students a well-trained faculty support team for all queries and guidance to ensure gain the best from the course.

Career Services: Our lifelong career services, job resources and guidance from market experts become available to you the moment the course starts and lasts throughout your professional career.

Lifelong learning: Access to an updated content (as per industry changes) for future reference for the participants. Some other important features of the program are followings:

1. Industry driven detailed curriculum.
2. Easy to understand the language from industry experts.
3. Comprehensive theoretical knowledge.
4. Practical training in live trading software.

While this is a non-technical Program and participants do not require the ability to code, there are optional activities for those who would like to engage with building an algorithmic trading model in Python. To complete these activities, participants will need Python programming experience. However, those who don't have the relevant skills will receive a screencast model answer to learn from.

4. Objective

This Program will benefit under-graduates & graduates and new hires to quantitative finance firms and will gain an essential introduction to the world of automated trading, while risk, compliance, and legal professionals seeking to improve their professional knowledge of algo trading and its regulatory framework will find the Program particularly valuable. The MBA in Algorithmic Trading offered by Department of Business Management will also benefit traders, investors, and financial professionals who want to understand what algo trading has to offer as a trading strategy. Business leaders (senior

managers, c-suite executives, directors and VPs) who are managing a group of traders, a fund, or company, will gain the insight to implement algorithmic trading strategies and communicate with their teams on the subject. The Program will also be of value to technology professionals who want to understand the strategies behind the creation of rule-driven trading models. Besides the above objectives, some other important objectives of the program are followings:

- Understand the basics of Algo trading and its future application
- Get acquaintance with advantages and drawbacks of algorithmic trading
- Explore different Algo trading methodologies
- Learn practical methods to create trading strategies in Algo software
- Learn how to use the best software for algorithm trading in India
- Understand how to create a program and execute orders in different market traders
- Learn how to create different trading strategies
- Understand Risk Management in Algorithmic Trading.
- Master Algorithmic Trading and its Audit and Compliance Process.
- Become independent in using excel sheet for system trading.

5. Target Pupils

The program is ideal for:

1. Anyone who wants to learn Algorithm Trading.
2. **Institutional investors:** Who wants to involve in purchase in larger quantities of stocks like mutual funds, pension funds, etc.
3. **Traders:** Who wants to work in a brokerage firm, banks, insurance, arbitrage, mutual funds, hedge funds, etc.
4. **Veteran investors:** Anyone who wants to learn automated trading, algorithmic trading, or quantitative trading.
5. **Brokers and Sub-brokers:** As a financial professional, develop familiarity with algorithmic trading, with unique insights from industry leaders and top systematic trading academics.
6. **Corporate Executives:** Business leaders and tech professionals will gain insights into the strategies behind effective trading models, and discover how technology trends are set to impact the future of algorithmic trading.

7. **Fund Managers:** Learn about the types of questions one should ask when allocating funds to a quantitative firm or when interacting with players in the algorithmic trading industry.
8. Retail investors, dealers, prop traders, equity traders etc who want to work in a trading desk at a financial institution or set up their own independent algorithmic app.
9. Based on key evaluation criteria, traders and investors will learn how to formulate views on whether a trading model or fund is worth investing in.

6. Job Opportunities

After completing the online Algo Trading course students can grow their career in algorithmic trading and quantitative trading as a financial planner, wealth manager, risk management, portfolio manager, etc.

On successful completion of the course, participants would be conceptually comfortable with:

- Managing and analysing data for algorithmic trading and building econometric models
- Learn how to back-test, implement and trade advanced quantitative trading strategies
- Using programming skills to work on algorithmic trading systems
- Using statistical packages and integrating them to your trading system
- Understanding of market making, spread optimization, transaction cost analytics and advanced risk management
- Using Option pricing models for running volatility books and making markets
- Electric blend of practical and theoretical knowledge
- Desk - Implement pricing models that are directly used by traders
- Model Validation - Implement pricing models to validate Front Office models
- Front Office - Develop and manage models for calculating the price of assets on the markets
- Investment/Asset Management - Develop models for mitigation of losses in investments
- Research - Research and create new approaches for pricing
- Developer - A developer/Programmer from the field of finance
- Statistical Arbitrage - Identify data patterns and suggest automated trades based on the findings
- Capital - Model the bank's credit exposures and capital requirements

The above are the some of the roles which prevail in the market among the various other types. Developers are also sought after in the domain of High-Frequency Trading (HFT Trading)

7. Eligibility for the Algo Trading course:

MBA in Algorithmic Trading offered by Department of Business Management, Dr. Harisingh Vishwavidyalaya is a post graduate degree program. Eligibility criteria for this PG program is graduates (10+2+3). Although the knowledge of stock market basics, trading strategies and technical analysis may be required. Basic knowledge of using excel sheets and must have a basic computer knowledge may be required. This program is designed for student, investors and traders who have no or minimal knowledge of programming. It doesn't require anyone with background knowledge of computer science or coding.

8. Admission Procedure

Admissions to MBA in Algorithmic Trading are done through entrance examinations. Upon qualifying for the entrance examination like CUCET etc. The duration of masters-level programmes is 2 years. Interviews are also held for candidates after the entrance examination.

9. Intake of the Program:

(30 Seats)

10. Proposed Course Fees (Per Semester)

Year	Semester	Fees per Semester	Annual Fees
I	First	₹ 75,000/-	₹ 1,50,000/-
	Second	₹ 75,000/-	
II	Third	₹ 75,000/-	₹ 1,50,000/-
	Fourth	₹ 75,000/-	
Total			₹ 3,00,000/-

Note: -

- (i) 10 % fees will be increased after every two years.
- (ii) 80 % Fees will be Reserved/retained for the Department.

11. Program Curriculum

First Year

Semester - I	
Paper 1:	Indian Financial System & Foreign Exchange.
Paper 2:	Advance Statistics for Financial Markets and Quant Strategies.
Paper 3:	Financial Derivatives.
Paper 4:	Mutual Funds and Portfolio Management.
Paper 5:	MS-Excel
Paper 6:	Introduction to Python

Semester - II	
Paper 1:	Data Analysis and Modelling in Python
Paper 2:	State of Investment Industry, Classic & Behavioural Finance.
Paper 3:	MATLAB
Paper 4:	Market Micro Structure for Trading.
Paper 5:	Trading Technology, Infra, & Operations.
Paper 6:	Introduction to Algorithmic Trading

Second Year

Semester - III	
Paper 1:	Trading & Back-Testing Platforms
Paper 2:	Algo Trading Strategies
Paper 3:	Risk Management in Algo Trading
Paper 4:	Machine Learning for Trading
Paper 5:	Technical Analysis, Methodology & Design of Systematic Trading
Paper 6:	Future Trends in Algorithmic Trading

Semester - IV	
Paper 1:	Working Strategy and Ideation.
Paper 2:	Live Algorithmic Trading Practical with Various Software.
Paper 3:	Practices Under Practicians and Domain Experts
Paper 4:	Project Work.

12. Scheme of Assessment

The scheme for the assessment will be according to University' ordinance and will follow UGC' CBCS pattern of Examination.

13. Budget Estimates

The Department will be equipped with modern infrastructure and supported with faculty members, experts & skilled staff.

The tentative requirement of work-force is as below:

S. No.	Particulars	No. Required
1.	Director/Professor In-Charge	01
2.	Associate Professor	02
3.	Assistant Professor	06
4.	Computer Operator	02
5.	Technical Staff	06
6.	Supporting Staff/MTS	06
Total		23

Subsequent Yearly Budget Requirement:

S. No.	Budget	Amount in Lakhs (₹)
1.	Staff	240
2.	Infrastructure/Building	10
3.	Equipment	30
4.	Consumables	12
5.	Teaching Aids	12
Total		324

Program Curriculum

First Year

Semester - I	
Paper 1:	Indian Financial System & Foreign Exchange.
Paper 2:	Advance Statistics for Financial Markets and Quant Strategies.
Paper 3:	Financial Derivatives.
Paper 4:	Mutual Funds and Portfolio Management.
Paper 5:	MS-Excel
Paper 6:	Introduction to Python

Semester - II	
Paper 1:	Data Analysis and Modelling in Python
Paper 2:	State of Investment Industry, Classic & Behavioural Finance.
Paper 3:	MATLAB
Paper 4:	Market Micro Structure for Trading.
Paper 5:	Trading Technology, Infra, & Operations.
Paper 6:	Introduction to Algorithmic Trading

Second Year

Semester - III	
Paper 1:	Trading & Back-Testing Platforms
Paper 2:	Algo Trading Strategies
Paper 3:	Risk Management in Algo Trading
Paper 4:	Machine Learning for Trading
Paper 5:	Technical Analysis, Methodology & Design of Systematic Trading
Paper 6:	Future Trends in Algorithmic Trading

Semester - IV	
Paper 1:	Working Strategy and Ideation.
Paper 2:	Live Algorithmic Trading Practical with Various Software.
Paper 3:	Practices Under Practicians and Domain Experts
Paper 4:	Project Work.

First Year

Semester - I	
BUM-CC-121(A)	Indian Financial System & Foreign Exchange
BUM-CC-122(A)	Advance Statistics for Financial Markets and Quant Strategies
BUM-CC-123(A)	Financial Derivatives
BUM-CC-124(A)	Mutual Funds and Portfolio Management
BUM-CC-125(A)	MS-Excel
BUM-CC-126(A)	Introduction to Python

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
1.	BUM-CC-121(A)	Indian Financial System & Foreign Exchange	100	4	3	1	0	4
2.	BUM-CC-122(A)	Advance Statistics for Financial Markets and Quant Strategies	100	4	3	1	0	4
3.	BUM-CC-123(A)	Financial Derivatives	100	4	3	1	0	4
4.	BUM-CC-124(A)	Mutual Funds and Portfolio Management	100	4	3	1	0	4
5.	BUM-CC-125(A)	MS-Excel	100	4	2	0	2	4
6.	BUM-CC-126(A)	Introduction to Python	100	4	2	0	2	4
Total			600	24	16	4	4	24

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
1.	BUM-CC-121(A)	Indian Financial System & Foreign Exchange	100	4	3	1	0	4

Course Objective:

The objective of this paper is to introduce the students with the different aspects and components of Financial market in any financial system and particularly to Indian Financial System. This course encompasses various issues related to international capital markets, foreign exchange rate determination and global financial management.

UNIT	Contents	Max. Hrs.
UNIT – I	Introduction: An overview of Indian Financial System, Components of Financial System, Financial Intermediation, Flow of Funds Matrix, Financial System and Economic Development, Integration of Indian Financial Market with global financial market. Functions of Financial Sectors, Equilibrium in Financial Markets, Financial Development; Overall comparative analysis of financial market in India & UK / China / Euro Zone / Japan / Brazil / Russia and South Africa	12 Hrs.
UNIT – II	Types of Financial Market- Money Market, Capital Market – Primary & secondary market, Forex Market, Debt Market- role and functions of this market; Instruments of Financial Market: Call money market, T- Bills, Commercial bills, Commercial papers and Certificates of deposits, Government (Gilt- Edged) securities and Industrial securities Banking system in India: Kinds of banking companies, commercial banks, development banks.	12 Hrs.
UNIT – III	Stock Markets- Trading mechanism, Major stock exchange: NSE, BSE, OTCEI, Stock market indices. Factors affecting stock market; analysis of market indices- SENSEX and NIFTY components, calculation and revision, International Stock Exchange and its Operation: NYSE, NASDAQ, LSE, Role of IT in Capital Market: (BOLT & NSE) Provident Funds, Pension Funds, Chit Funds: Objective and functions Debt Market: Personal Loans, Car Loans, Home Loans etc.	12 Hrs.
UNIT – IV	Mortgage market: Primary and secondary mortgage market, participants in mortgage markets, International trends in securitization Derivative Securities markets: Forward, futures, options and financial Swaps market, trading mechanism, regulatory framework and pricing of the instruments. Financial Intermediaries: Commercial Banks: Credit system for short-term developments in credit information system. Development Banks: Structure, Philosophy and Operations. Non-Banking Financial Cos - types, role and function. Regulatory framework for NBFCs, Provident Funds, Pension Funds- objective and functions. Real Assets: Land and house property, bullion, art and precious stones	12 Hrs.
UNIT – V	Foreign Exchange Market: Nature, Structure, Types of transactions, Exchange rate quotation & Arbitrage, Spot & Forward, Foreign Exchange Market in India: Nature, Structure, Operations & Limitations, Exchange Rate Determination: Structural Models of Exchange Rate Determination, Exchange Rate Forecasting, The Exchange Rate of Rupee Foreign Exchange Risk Exposure: Types of Risk, The Risk Management Process: Hedging, Swaps, Futures, Options, Types of Derivatives, Role of SEBI/RBI	12 Hrs.

Books Recommended:

- Apte, P.G., International Financial Management, McGraw Hill Education Private Limited, Delhi
- Shapiro., Multinational Financial Management. WILEY, India
- LM Bhole; Financial Markets and Institutions: (TMH)

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
2.	BUM-CC-122(A)	Advance Statistics for Financial Markets and Quant Strategies	100	4	3	1	0	4

Course Objective:

The goal of this program is conceptual learning and hands-on advance statistics with real-life portfolios and enterprise systems in Advance Statistics and employ these strategies for Financial Markets.

UNIT	Contents	Max. Hrs.
UNIT – I	Basic Statistics including Probability Distributions: Standard Normal Distribution; Related parameters like Z-score, confidence interval and their use, and Hypothesis Testing, Covariance, Correlation and Regression and their physical significance Data Visualization: Statistics and probability concepts (Bayesian and Frequentist methodologies), moments of data and Central Limit Theorem	12 Hrs.
UNIT – II	Applications of statistics: Random Walk Model for predicting future stock prices using simulations and inferring outcomes, Capital Asset Pricing Model, Modern Portfolio Theory - statistical approximations of risk/reward	12 Hrs.
UNIT – III	Time series analysis and statistical functions including autocorrelation function, partial autocorrelation function, Akaike Information Criterion, Stationarity of time series, Autoregressive Process, Forecasting using ARIMA, Difference between ARCH and GARCH and Understanding volatility	12 Hrs.
UNIT – IV	Selected Financial Applications: Pricing Options with Flexible Volatility Estimators, Value at Risk and Backtesting, Copulae and Value at Risk, Statistics of Extreme Risks, Neural Networks, Volatility Risk of Option Portfolios, Nonparametric Estimators for the Probability of Default, Credit Risk Management	12 Hrs.
UNIT – V	Statistical Methods in Risk Management: Financial risks and measures of market risk, Statistical models for VaR and ES, Measuring risk for nonlinear portfolios, Stress testing and extreme value theory	12 Hrs.

Books Recommended:

- Statistical Models and Methods for Financial Markets by Tze Leung Lai, Haipeng Xing: Springer Publication. ISBN: 978-0-387-77827-3
- Statistics of Financial Markets: An Introduction by Jürgen Franke, Wolfgang K. Härdle, Christian M. Hafner : Springer Publication. ISBN: 978-3-540-76272-0

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
3.	BUM-CC-123(A)	Financial Derivatives	100	4	3	1	0	4

Course Objective:

This course aims at providing an in-depth understanding of financial derivatives in terms of concepts, structure, instruments and trading strategies for profit and risk management.

UNIT	Contents	Max. Hrs.
UNIT – I	Financial Derivatives - Introduction, economic benefits of derivatives - Types of financial derivatives - Features of derivatives market - Factors contributing to the growth of derivatives - functions of derivative markets - Exchange traded versus OTC derivatives - traders in derivatives markets - Derivatives market in India	12 Hrs.
UNIT – II	Financial Derivatives - Introduction, economic benefits of derivatives - Types of financial derivatives - Features of derivatives market - Factors contributing to the growth of derivatives - functions of derivative markets - Exchange traded versus OTC derivatives - traders in derivatives markets - Derivatives market in India Interest rate markets - Type of rates, Determining Zero rates, Forward rate agreements (FRA), Interest rate derivatives.	12 Hrs.
UNIT – III	Financial Swaps - features and uses of swaps - Mechanics of interest rate swaps – valuation of interest rate swaps – currency swaps – valuation of currency swaps. Commodity derivatives: commodity futures market-exchanges for commodity futures in India, Forward Market Commissions and regulation-commodities traded – trading and settlements – physical delivery of commodities.	12 Hrs.
UNIT – IV	Options: Types of options, option pricing, factors affecting option pricing – call and put options on dividend and non-dividend paying stocks put-call parity - mechanics of options - stock options - options on stock index - options on futures – interest rate options. Concept of exotic option. Hedging & Trading strategies involving options, valuation of option: basic model, one step binomial model, Black and Scholes Model, option Greeks. Arbitrage profits in options.	12 Hrs.
UNIT – V	Credit risk - Bond prices and the probability of default, Historical default experience, reducing exposure to Credit risk, Credit default swaps, Total return swaps, Credit spread options, Collateralized debt obligation. Basics of Interest rate risk and risk management strategies. Value at Risk (VAR) - Measure, Historical simulation, Model building approach, linear approach, Quadratic model, Monte Carlo simulation, stress testing and back testing	12 Hrs.

Books Recommended:

- Derivatives and Risk Management by Sundaram Janakiramanan: Pearson Education
- Derivatives & Risk Management by Rajiv Srivastava: Oxford University

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
4.	BUM-CC-124(A)	Mutual Funds and Portfolio Management	100	4	3	1	0	4

Course Objective:

The basic objective of the course is to acquaint the students with investment decisions related to financial assets. The students will also be exposed to measurement of the risks and the returns involved in financial investments and will be made aware about the functioning of securities market along with the theories and concepts involved in portfolio management.

UNIT	Contents	Max. Hrs.
UNIT – I	Investment: Meaning, Nature and Scope, Decision Process; Investment Alternatives; Investment Risks – Interest Risk, Market Risk, Inflation Risk, Default Risk, etc.; Measurement of Systematic and Unsystematic Risk, Valuation of Securities, Duration of bonds, Terms Structure of Interest Rates, Yield to Maturity	12 Hrs.
UNIT – II	Measurement of Risk, Techniques of Risk Measurement and their Application, Concept of Beta, Classification of Beta- Geared and Ungeared Beta, Project Beta, Portfolio Beta, Decomposition of total risk into systematic and unsystematic risk, Securities Market Line, Capital Market Line.	12 Hrs.
UNIT – III	Efficient Market Hypothesis, Security Analysis: Fundamental Analysis; Economy, Industry and Company Analysis and Technical Analysis; Dow Jones Theory, Elliot Wave Theory, Patterns of Charts, Mathematical Indicators, Risk Management with technical analysis.	12 Hrs.
UNIT – IV	Portfolio Analysis, Portfolio Selection and Portfolio Theories – Markowitz Model and Capital Assets Pricing Model, Arbitrage Pricing Theory, Sharp Optimization Model, Constructing an optimal portfolio, Portfolio Revision and Performance Evaluation of Managed Portfolios – Sharp Ratio; Treynor Ratio; Jensen’s Alpha, Fama’s Net Selectivity Ratio.	12 Hrs.
UNIT – V	Mutual Funds: Introduction and their role in capital market development Mutual Fund concept, types and functioning, Limitations of MF, Mutual Funds, mechanism, types of schemes, Mutual funds industry in India – recent developments; instruments, growth and performance of mutual funds	12 Hrs.

Books Recommended:

- Chandra, Prasanna., Investment Analysis and Portfolio Management, McGraw Hill Education
- Punithavathy, Pandian, Security Analysis and Portfolio Management, Vikas Publication
- Fischer, Donald E. and Ronald J. Jordan, Security Analysis and Portfolio Management, Pearson Education

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
5.	BUM-CC-125(A)	MS-Excel	100	4	2	0	2	4

Course Objective:

The objectives of this course id to equip students with intensive data analysis which incorporates data from other systems, for example external sources like SAP, Sage among others. This may include consolidating corporate budgets and forecasts from various departments, cash flow management, tracking invoices, management reporting among others which require flexible knowledge and use of various Advanced Excel Functions and Features.

UNIT	Contents	Max. Hrs.
UNIT – I	Excel Introduction: Excel Interface, Create Worksheets and Workbooks, Basic Navigation, entering information into cells, types of data (text, numbers, dates), Basic formatting, working with multiple Worksheets, Navigate in Worksheets and Workbooks & Editing	12 Hrs.
UNIT – II	Editing, Copying, pasting, inserting and deleting cells, ranges of cells, rows, columns and Worksheets. 'Special' pasting, Viewing, Spreadsheet structure, Cell references, Named Ranges, Design, Basic Macros: Introduction and Macro Security, Recording a Macro, Assign a Macro to a Button or Shape, Run a Macro upon Opening a Workbook, How to Inspect and Modify a Macro	12 Hrs.
UNIT – III	Customising Excel: Font Face, Number of Worksheets, Frequency of Auto-recovery, Default View, Autocorrect and Ribbon Alterations. Excel Add-Ins – Solver, Analysis Toolpak. PowerPivot And Inquire, Naming and storing Excel files, Version control, making backups, Connecting Workbooks, Documentation, Protecting and Sharing, Googledocs, Excel troubleshooting	12 Hrs.
UNIT – IV	Data handling: Sorting & Filtering, controlling user input, Working with Dates and Times, Working with Text, Lookup & Reference, Logical Functions	10 Hrs.
UNIT – V	Data analysis: Working with Numbers, Summarising data, PivotTables 1 – Simple Summaries, PivotTables 2 – Manipulating Data, PivotTables 3 – Interpreting Data, PowerPivot – Handling Big Data, Formula Auditing, Advanced Macros and VBA Modelling Presentation: Cell Formatting, Number Formatting, Conditional Formatting, Graphs and Charts, Page & Print Setup	14 Hrs.

Books Recommended:

- Excel 2016 Bible, by John Walkenbach
- Excel: Quick Start Guide from Beginner to Expert, by William Fischer
- Building Financial Models with Microsoft Excel, by K. Scott Proctor

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
6.	BUM-CC-126(A)	Introduction to Python	100	4	2	0	2	4

Course Objective:

This course provides an introduction to programming and the Python language. Students are introduced to core programming concepts like data structures, conditionals, loops, variables, and functions. This course includes an overview of the various tools available for writing and running Python, and gets students coding quickly. It also provides hands-on coding exercises using commonly used data structures, writing custom functions, and reading and writing to files.

UNIT	Contents	Max. Hrs.
UNIT – I	Introduction to Python: what is Python, history of Python, Python Features, Python Applications, Getting Python Installation, Setting path at Unix/Linux, Windows, Environment setup	12 Hrs.
UNIT – II	Python Fundamentals Python Identifiers, Keywords, Lines and Indentation, Comments, Quotation, Blank Lines, Multi-Line Statements, Command Line Arguments, Variable and Data Types, Python Numbers, Lists, Tuples, Dictionary, Multiple Assignments, Input Function, Operators, Operator precedence	12 Hrs.
UNIT – III	Control Structures If Statement, If..else Statement, The elif Statement, While Loop, The Infinite Loop, For Loops, Iterating by Sequence Index, Nested Loops, Loop Control Statements, Break Statement, Continue Statement, Pass Statement, single statement suites, arrays in python	12 Hrs.
UNIT – IV	Functions and Modules Defining a function, Calling a Function, Function Arguments, Passing by Reference, Passing by Value, Function Arguments, Modules, The import Statement, The from...import * Statement, Locating Modules, Packages in Python, Commonly used Python modules	12 Hrs.
UNIT – V	I/O and Error Handling in Python: Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data from a File, Additional File Methods, Using Pipes as Data Streams, Handling IO Exceptions, Working with Directories, Metadata, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions.	12 Hrs.

Books Recommended:

- Dive into Python, Mike.
- Learning Python, 4th Edition by Mark Lutz.
- Programming Python, 4th Edition by Mark Lutz

Semester - II	
BUM-CC-221(A)	Data Analysis and Modelling in Python
BUM-CC-222(A)	State of Investment Industry, Classic & Behavioural Finance.
BUM-CC-223(A)	MATLAB
BUM-CC-224(A)	Market Micro Structure for Trading
BUM-CC-225(A)	Trading Technology, Infra, & Operations
BUM-CC-226(A)	Introduction to Algorithmic Trading

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
1.	BUM-CC-221(A)	Data Analysis and Modelling in Python	100	4	3	0	1	4
2.	BUM-CC-222(A)	State of Investment Industry, Classic & Behavioural Finance	100	4	3	1	0	4
3.	BUM-CC-223(A)	MATLAB	100	4	2	0	2	4
4.	BUM-CC-224(A)	Market Micro Structure for Trading	100	4	3	1	0	4
5.	BUM-CC-225(A)	Trading Technology, Infra, & Operations	100	4	3	0	1	4
6.	BUM-CC-226(A)	Introduction to Algorithmic Trading	100	4	3	1	0	4
Total			600	24	15	3	4	24

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
1.	BUM-CC-221(A)	Data Analysis and Modelling in Python	100	4	3	0	1	4

Course Objective:

This course is designed to teach students how to analyze different types of data using Python. Students will learn how to prepare data for analysis, perform simple statistical analysis, create meaningful data visualizations and predict future trends from data

UNIT	Contents	Max. Hrs.
UNIT – I	Python Fundamentals for Data Analysis: Python data structures, Control statements, Functions, Object Oriented programming concepts using classes, objects and methods, Exception handling, Implementation of user-defined Modules and Package, File handling in python.	12 Hrs.
UNIT – II	Introduction to Data Understanding and Pre-processing, Data Processing and Visualization, Data Formatting, Exploratory Data Analysis, Filtering and hierarchical indexing using Pandas. Data Visualization: Basic Visualization Tools, Specialized Visualization Tools, Seaborn Creating and Plotting Maps.	12 Hrs.
UNIT – III	Mathematical and Scientific applications for Data Analysis: Numpy and Scipy Package, Understanding and creating N-dimensional arrays, Basic indexing and slicing, Boolean indexing, Fancy indexing, Universal functions, Data processing using arrays, File input and output with arrays.	12 Hrs.
UNIT – IV	Model Development and Evaluation: Introduction to machine learning- Supervised and Unsupervised Learning, Model development using Linear Regression, Model Visualization, Prediction and Decision Making, Model Evaluation: Over-fitting, Under-fitting and Model Selection, Analysing Web Data.	12 Hrs.
UNIT – V	Back-testing methodologies & techniques and using Random Walk Hypothesis, Quantitative analysis using Python: Compute statistical parameters, perform regression analysis and PCA, understanding VaR, Visualizing Correlation between Financial Time Series, Work on sample strategies, trade using modified Faber as well as options trading strategies in Python, Walkthrough the trading lifecycle & steps to generate alphas	12 Hrs.

Books Recommended:

- David Ascher and Mark Lutz, Learning Python, Publisher O'Reilly Media.
- Reema Thareja, "Python Programming using Problem Solving approach", Oxford University press.
- Wes McKinney "Python for Data Analysis", First edition, Publisher O'Reilly Media.
- Allen Downey, Jeffrey Elkner, Chris Meyers, Learning with Python, Dreamtech Press
- David Taieb, "Data Analysis with Python: A Modern Approach " 1st Edition, Packt Publishing

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
2.	BUM-CC-222(A)	State of Investment Industry, Classic & Behavioural Finance	100	4	3	1	0	4

Course Objective:

To help students appreciate the limitations of 'rational' models of investment decision making) To introduce students to an alternate framework for understanding price discovery in the markets) To help students identify persistent or systematic behavioral factors that influence investment behavior

UNIT	Contents	Max. Hrs.
UNIT – I	The Investment Industry: A Top-Down View, Ethics and Investment Professionalism, Regulation, Structure of the Investment Industry, Investment Vehicles, Investors and Their Needs, Investment Management, Performance Evaluation, Investment Industry Documentation	12 Hrs.
UNIT – II	Brief overview of rational finance and classical finance theories: Rise of the rational market hypothesis, Brief overview of classical finance theories: Expected utility theory, Modern portfolio theory, Capital Asset Pricing model, Efficient market hypothesis, MM theory – investors are rational o Arbitrage pricing theory, Random walk hypothesis, Challenging the classical assumptions of finance, Financial market anomalies: Fundamental anomalies, Technical anomalies, Calendar or seasonal anomalies.	12 Hrs.
UNIT – III	Foundation of Behavioural Finance, Rationality to Psychology, Agency Theory, Prospect Theory, Traders Brain, Overreaction and Optimism.	12 Hrs.
UNIT – IV	Behavioural aspects of Investing: Behavioural Portfolio theory, Psychographic models, Sound Investment Philosophy. Market Bubbles: Introduction and brief history of stock market bubbles, Identification and classification of a stock market bubble, explaining bubbles through behavioural finance, Investor behavior during bubbles, Causes of bubbles. Value Investing: Central tenets of value investing, Evidence and prospects of value investing	12 Hrs.
UNIT – V	Neurofinance: Neural processes during financial decision making, Future of Neurofinance, Adaptive Market Hypothesis. Forensic Accounting: Classifications of fraud, Behavioural aspects of Fraud, Origin and growth of forensic accounting, Fraud theories, Tools in Forensic Accounting. Behavioural Corporate Finance: Approaches to behavioural corporate finance, Market timing and catering approach, Issues related to valuation, dividend policy, mergers and acquisitions.	12 Hrs.

Books Recommended:

- Behavioural Finance: Insights into Irrational Minds and Markets (The Wiley Finance Series)
- Behavioral Finance and Wealth Management: How to Build Investment Strategies That Account for Investor Biases: (Wiley Finance)
- Behavioral Finance: Understanding the Social, Cognitive, and Economic Debates: (Wiley Finance)

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
3.	BUM-CC-223(A)	MATLAB	100	4	2	0	2	4

Course Objective:

The course provides a gentle introduction to the MATLAB computing environment, and is intended for beginning users and those looking for a review. It is designed to give students a basic understanding of MATLAB, including popular toolboxes. The course consists of interactive lectures and sample MATLAB problems given as assignments and discussed in class. No prior programming experience or knowledge of MATLAB is assumed. Concepts covered include basic use, graphical representations and tips for designing and implementing MATLAB code.

UNIT	Contents	Max. Hrs.
UNIT – I	MATLAB: An Overview, Brief history of MATLAB, About MATLAB, Installation of MATLAB, Help browser, Arranging the desktop, Basic functions of Matlab, Mostly used symbols in MATLAB, debugging in Matlab; Building MATLAB expressions: MATLAB datatype, command handling, MATLAB basics	12 Hrs.
UNIT – II	MATLAB Vector and Matrix: Scalar and vector, elementary features in a vector array, matrices, eigen values and eigen vectors, matrix operations, matrix operators, creating matrix arrangement, indexing array value, other operations, mathematical operations on array, array types	12 Hrs.
UNIT – III	Graphics in MATLAB: 2D plots, parametric plots, contour lines and implicit plots, field plots, multiple graphics display function, 3D plots, multivariate data, data analysis.	12 Hrs.
UNIT – IV	MATLAB programming introduction to M-files, MATLAB editors, M files, scripts, functions, MATLAB error and correction, MATLAB debugger; Digital Image Processing with MATLAB (Image Processing).	12 Hrs.
UNIT – V	MATLAB in neural networks: About neural networks, Human and artificial neuron, Architecture of neural networks (feed-forward, feedback, network layers), The McCulloch- Pitts Model of Neuron, The Perceptron, Transfer function, neural network toolbox, Actual model, applications of neural network.	12 Hrs.

Books Recommended:

- Swapna Kumar, S V B Lenina: MATLAB – Esay way of learning, PHI Learning, 2016
- Amos Gilat, "An Introduction with Applications ,4ed " , wiley India
- "A Guide to MATLAB - for Beginners and Experienced Users", 2nd Ed., Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, Cambridge University Press, (2006).
- "Essentials of MATLAB Programming", 2nd Ed., Stephen J. Chapman, Cengage Learning, (2009).
- "MATLAB Demystified", David McMahon, The McGraw-Hill Companies, (2007).
- "MATLAB® for Engineers", 3rd Ed., Holly Moore, Pearson Education, Inc., (2012).
- "Engineering computation with MATLAB", 2nd Ed., David M. Smith, Pearson Education, Inc.2010).

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
4.	BUM-CC-224(A)	Market Micro Structure for Trading	100	4	3	1	0	4

Course Objective:

This course will introduce students to market microstructure models used for describing price formation: zero intelligence models, sequential and information-based models, and limit-order book models. The course will also introduce several popular trading strategies: trend, momentum and oscillator-based strategies, arbitrage trading strategies, as well as methods for estimating and back-testing the strategies.

UNIT	Contents	Max. Hrs.
UNIT – I	Introduction: Institutions and market structure. Fundamentals: Market functions, Participants, Liquidity. Information and prices; Rational Expectations Equilibrium (REE)	12 Hrs.
UNIT – II	The Structure of Trading: The Trading Industry, Orders and Order Properties, Market Structures, Order-Driven Market Mechanisms, Brokers	12 Hrs.
UNIT – III	Market Structures: Index and Portfolio Markets, Specialists, Internalization, Preferencing, and Crossing, Competition Within and Among Markets, Floor Versus Automated Trading Systems, Bubbles, Crashes, and Circuit Breakers, Insider Trading	12 Hrs.
UNIT – IV	Limit Order Books: Market and Limit Orders, Limit Order Book, Limit Price Placement, Stop-Loss Orders, Short-Selling, Other Order Instructions, execution costs, price opportunity costs, exposure costs and the choice of the optimal order submission strategy.	12 Hrs.
UNIT – V	Origins of Liquidity and Volatility: Liquidity, Volatility. Evaluation and Prediction: Liquidity and Transaction Cost Measurement, Performance Evaluation and Prediction	12 Hrs.

Books Recommended:

- Larry Harris, Trading and Exchanges: Market Microstructure for Practitioners. Oxford University Press 2002
- Anatoly B. Schmidt, Financial Markets and Trading: An Introduction to Market Micro-structure and Trading Strategies, Wiley, 2010
- Joel Hasbrouck, Empirical Market Microstructure, Oxford University Press, 2007

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
5.	BUM-CC-225(A)	Trading Technology, Infra, & Operations	100	4	3	0	1	4

Course Objective:

This course will introduce students helps in developing a technology plan is adapting to rapidly evolving business needs while balancing competing priorities. The goal is to study robust, resilient, and scalable technology platform while ensuring solutions are delivered quickly, on-budget, and are easy to implement and support. Technology is a critical component of the investment and trading process, and all business groups require appropriate technology solutions to be effective.

UNIT	Contents	Max. Hrs.
UNIT – I	System Architecture of an automated trading system, Infrastructure (hardware, physical, network, etc.) requirements	12 Hrs.
UNIT – II	Understanding the business environment (including regulatory environment, financials, business insights, etc.) for setting up an Algorithmic Trading desk, Comprehensive practical understanding to setup an algorithmic trading desk	12 Hrs.
UNIT – III	Order Management: order entry, order routing. Algorithmic trading: Infrastructure requirements for algorithmic trading, designing an environment for algorithmic trading, Implementing trading rules, Testing	12 Hrs.
UNIT – IV	Other requirements: Clearing and settlement, regulations compliances: overview of regulatory concerns, Measures adopted by securities markets regulators in different countries, what does IOSCO prescribe	12 Hrs.
UNIT – V	Algo Trading and Exchange Approvals: Procedure for Gaining Algorithmic Trading Approval, Rules for checking Algos by the Exchange, Mechanism to capture change in algos at participants end by the exchange, Best Practices Internationally for Algorithmic Trading, qualification requirement for algo trading, Exchange ensure robustness of Algorithms on an ongoing basis, Algo Testing Lab	12 Hrs.

Books Recommended:

- Front-to-Back: Designing and Changing Trade Processing Infrastructure by Martin Walker.
- A Complete Guide to Technical Trading Tactics: How to Profit Using Pivot Points, Candlesticks & Other Indicators:(Wiley Trading) by John L. Person.

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
6.	BUM-CC-226(A)	Introduction to Algorithmic Trading	100	4	3	1	0	4

Course Objective:

This course will develop Python skills for Trading Technical Analysis and Algorithmic Trading.

UNIT	Contents	Max. Hrs.
UNIT – I	Introduction to Algorithmic Trading (At), Building Blocks of the Algorithms, Evolution of Algorithmic Trading, Types of Algorithms, Advantages of Algorithms, Disadvantages of Algorithms	12 Hrs.
UNIT – II	Classification of Algorithms Based on Life-Cycle Stage, Lifecycle of an Algorithm, Execution Algorithms, Development of Execution Algorithms, HFT Algorithms, Development of HFT Algorithms.	12 Hrs.
UNIT – III	Categorising Algorithms, Common Features of Algorithms, Impact-driven algorithms, Cost-driven algorithms, opportunistic algorithms, other trading algorithms	12 Hrs.
UNIT – IV	Introduction to HFT Algorithms, Benefits of HFT, Demerits of HFT, HFT Impact on Institutional Investors, HFT Impact on Volatility, Misusing HFT for Market Manipulation, Market Manipulation Techniques Using HFT	12 Hrs.
UNIT – V	Fears & Myths: Safety of Algorithmic Trading, Performance of Algorithmic Trading, Usefulness of Algorithmic Trading.	12 Hrs.

Books Recommended:

- An Introduction to Algorithmic Trading: Basic to Advanced Strategies Editor(s): Edward A Leshik, Jane Cralle. ISBN:9780470689547

Second Year

Semester - III	
BUM-CC-321(A)	Trading & Back-Testing Platforms
BUM-CC-322(A)	Algo Trading Strategies
BUM-CC-323(A)	Risk Management in Algo Trading
BUM-CC-324(A)	Machine Learning for Trading
BUM-CC-325(A)	Technical Analysis, Methodology & Design of Systematic Trading
BUM-CC-326(A)	Future Trends in Algorithmic Trading

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
1.	BUM-CC-321(A)	Trading & Back-Testing Platforms	100	4	2	0	2	4
2.	BUM-CC-322(A)	Algo Trading Strategies	100	4	3	0	1	4
3.	BUM-CC-323(A)	Risk Management in Algo Trading	100	4	3	1	0	4
4.	BUM-CC-324(A)	Machine Learning for Trading	100	4	2	0	2	4
5.	BUM-CC-325(A)	Technical Analysis, Methodology & Design of Systematic Trading	100	4	3	1	0	4
6.	BUM-CC-326(A)	Future Trends in Algorithmic Trading	100	4	3	1	0	4
Total			600	24	16	3	5	24

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
1.	BUM-CC-321(A)	Trading & Back-Testing Platforms	100	4	2	0	2	4

Course Objective:

To study various common backtest performance metrics. Backtest performance can easily be made unrealistic and unpredictable of future returns due to a long list of pitfalls, which will be examined in this course. The choice of a software platform for backtesting is also important, and criteria for this choice will be discussed. Illustrative examples are drawn from a futures strategy and a stock portfolio trading strategy.

UNIT	Contents	Max. Hrs.
UNIT - I	Overview of Backtesting: What is backtesting and how does it differ from “simulations”? Importance of backtesting, Limitations of backtesting, Steps to increase the predictive power of backtest results, avoidance of pitfalls, Identify good/bad strategies even before a backtest, Preview of various pitfalls through a series of examples. Introduction to Interactive Brokers platform & other platforms	12 Hrs.
UNIT - II	Backtest platform: Criteria for choosing a suitable backtest platform, List of backtesting platforms, pros and cons of each platform, integrated backtesting and automated execution platforms. Using IBridgePy API to automate trading strategies on Interactive Brokers platform, Tutorial to MATLAB: Survey of syntax, Advantage of array processing, building utility functions useful for backtesting, Using toolboxes	12 Hrs.
UNIT - III	Historical Database: Criteria for choosing a good historical database. Equities data: split/dividend adjustments, survivorship bias. Futures data: constructing continuous contracts, settlement vs closing prices. Issues with synchronicity of data. Issues with intraday/tick data.	12 Hrs.
UNIT - IV	Backtesting a Portfolio Strategy: Exercise: A long-short portfolio strategy of stocks, Relevance of strategy to 2007 quant funds meltdown, Importance of universe selection: impact of market capitalization, liquidity, and transactions costs on strategies. Strategy Refinement, Code and back-test different strategies on various backtesting & research/trading platforms, Backtesting a single-instrument strategy: Bollinger-band strategy for E-mini S&P500 futures (ES) as a prototype mean-reversion strategy. Performance measurement: The equity curve, Excess returns and the importance of the Sharpe ratio, Tail risks and maximum drawdown and drawdown duration, Importance of transaction costs estimates.	12 Hrs.
UNIT - V	Detection and Elimination of Backtesting Pitfalls and Bias: Detect look-ahead bias, avoid look-ahead bias. Data snooping bias: why out-of-sample testing is not a panacea, Parameter less trading, use of linear models or “averaging-in”: pros and cons, linearization of the ES Bollinger band strategy, Impact of noisy data on different types of strategies, Impact of historical or current short-sale constraint, unavoidable limitation of backtesting: Regime change, steps when live performance is below expectations.	12 Hrs.

Books Recommended:

- The Book of Back-tests: Trading Objectively: Back-testing and demystifying trading strategies. by Sofien Kaabar

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
2.	BUM-CC-322(A)	Algo Trading Strategies	100	4	3	0	1	4

Course Objective:

To Gain familiarity with the broad area of algorithmic trading strategies. Master the underlying theory and mechanics behind the most common strategies. Acquire the understanding of principals and context necessary for new academic research into the large number of open questions in the area.

UNIT	Contents	Max. Hrs.
UNIT – I	Overview: Introduction to algo trading strategies and their recent context in the world of alternative investment management, Alternatives, Hedge Funds, CTAs and Quant Funds their size and numbers, their opportunities, top to down look at the overall prospects of the industry where Algo Trading Strategies are employed.	12 Hrs.
UNIT – II	Algo Trading Strategy Infrastructure, ARMA Processes, basic mathematics for timeseries including white noise and brownian motion, Autocovariance, autocorrelation and criteria, Cross Validation, Bootstrap and solving SDEs, Basic ARMA models, Momentum - a first glance, Momentum variants, and fads and fancies in models, Coding Momentum, Momentum - capped, floored and otherwise altered signals	12 Hrs.
UNIT – III	Mean Reversion Overview and Time-scales of trades, features of an MR trading strategy, what to expect and what to be careful with, Rationales for Mean Reversion, Volatility and Mean Reversion, theory and empirics behind their relationship, Mean Reversion and Unit Root Tests, Augmented Dickey Fuller Tests, KPSS Tests, Variance Ratio Tests, Cointegration and Johansen Test, Harvey Nyblom Tests and Shortcomings, power of tests, confidence intervals, type 1 and type 2 errors	12 Hrs.
UNIT – IV	Changepoints: Overview and more classical approaches to changepoint detection, Lasso based tools, sequential binary segmentation, switching kalman filters. Overfitting: Intro to Overfitting and the major issues, Overfitting in Finance, Dealing with overfitting - increasing backtest length, Adjusted Sharpe Ratios and Multiple Hypothesis Tests, BHY adjustments and Practical Methods to prevent overfitting, practical approaches to backtest overfitting.	12 Hrs.
UNIT – V	Carry, Value, and Portfolio Strategies: Defining carry, positive and negative carry position, P vs Q measure, Carry for Swaps, bonds, Futures, FX, Equities and Derivatives. Value: define value, its use and how it differs from Equities, Value, with its longer-term mean-reversion properties, is naturally orthogonal to momentum, and mean-reversion. Portfolio Strategies: MVO, Portfolios - Testing weights, Portfolio Optimisation - Conditional Portfolios and other performance measures	12 Hrs.

Books Recommended:

- Algorithmic Trading: Winning Strategies and Their Rationale (Wiley Trading) by Ernie Chan
- Quantitative Trading: How to Build Your Own Algorithmic Trading Business (Wiley Trading) by Ernie Chan

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
3.	BUM-CC-323(A)	Risk Management in Algo Trading	100	4	3	1	0	4

Course Objective:

To explore the concepts, processes, and tools for developing algorithmic risk-management strategies. learn how to import, analyze, and visualize data from the market. advantages and disadvantages of algorithmic risk management.

UNIT	Contents	Max. Hrs.
UNIT – I	Risk Management in Trading: Introduction, Identification of Risks, Evaluation of Trading Risks, Risk Management Strategies and Elements: Portfolio optimisation, Hedging, 1% rule and 2% investing rule, Monitoring the trade while utilising advanced technology, avoiding unclear trade setups, Stop loss.	12 Hrs.
UNIT – II	Algorithmic risk management in trading and investing: Introduction, advantages and disadvantages of algorithmic risk management, concepts, process, and tools for developing risk-management strategies. why maximizing expected value of trades and investments risks ruin and why volatility and beta are inadequate measures of risk, Analyze and manage your financial risks using Python, pros and cons of the Kelly criterion and Markowitz's capital allocation strategies, importance of sizing trades and investments,	12 Hrs.
UNIT – III	Quantifying risks in trading and investing: Risk measures such as volatility, beta, VaR, adjusted VaR, and ES, strengths and weaknesses of VaR, adjusted VaR, and conditional VaR/ES,; algorithmic characteristics of a good risk measure, Hands-on exercises: Set up Colab notebook; create pandas Data Frames to import data; calculate, analyze, and visualize various risk measures	12 Hrs.
UNIT – IV	Using Monte Carlo simulations to estimate VaR and ES: Methods to estimate VaR, modified VaR, and ES; strengths and weaknesses, Hands-on exercise: Use pandas DataFrames and Monte Carlo simulations to estimate VaR and ES for stocks and portfolios. Applying the Kelly criterion and MPT to trading and investing: The Kelly criterion; how it differs from the Markowitz mean-variance theory; its strengths and weaknesses, Hands-on exercises: Use pandas DataFrames to analyze and visualize portfolios using MPT; use Monte Carlo simulations to demonstrate how the Kelly position sizing outperforms other capital allocation strategies.	12 Hrs.
UNIT – V	Import, analyze, and visualize data from the market using the pandas library as well as fundamental and alternative sources available for free on the web, Estimate Var and ES using Monte Carlo simulations, Analyze past trades to estimate your edge and odds, Apply the Kelly criterion to size trades, Build a portfolio of stocks using MPT, Analyze and design your own specific risk-management strategies in Python	12 Hrs.

Books Recommended:

- Python for Finance, 2nd Edition (book)
- Risk Management and Financial Institutions, 4th Edition (book)
- Mastering pandas for Finance by Michael Heydt. Packt Publishing ISBN: 9781783985104

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
4.	BUM-CC-324(A)	Machine Learning for Trading	100	4	2	0	2	4

Course Objective: This course provides the foundation for developing advanced trading strategies using machine learning techniques. The basic objectives of this course are to design basic quantitative trading strategies, Use Keras and Tensorflow to build machine learning models, build a pair trading strategy prediction model and back test it, Build a momentum-based trading model and back test it.

UNIT	Contents	Max. Hrs.
UNIT - I	Introduction: Terminologies of Machine Learning, About Machine Learning, Where to Application of Machine Learning, Uses of Feature Selection, Modeling data with AI, index & machine learning concepts. Types of Machine Learning: Dividing the Dataset, Supervised Learning, Regression Problem, Unsupervised Learning, Clustering Belong.	12 Hrs.
UNIT - II	Supervised Learning: Use Jupyter Notebook, Linear Regression, Equation for Linear Regression, Find the Predicted Price, Logistic Regression, Output of Logistic Regression, Which Machine Learning Algorithm, KNN Classification, KNN Algorithm, Support Vector Machine, Hyperplane, Machine Learning Models, Random Forest, Artificial Neural Network, Output of an Artificial Neural Network.	12 Hrs.
UNIT - III	Unsupervised Learning: K-Means Clustering, Statistical Arbitrage. Reinforcement Learning: Reinforcement Learning Example, Optimal Execution Price, Assumptions of Reinforcement Learning, Optimal Action, Reward. Predict Trend Using Classification: Stock Market Prediction, Assumptions of Prediction Model, Feature Identification, Classification Algorithm, Support Vector Classifier Strategy, Name the Algorithm, Type of Data used, Length of the Test Data, Import SVM Module, Read Data from CSV File, Target Variable, Create Classifier Model, Predict Trading Signals.	12 Hrs.
UNIT - IV	Natural Language Processing: Introduction to NLP, Positive Sentiment Score, Financial Data. TensorFlow: Introduction to TensorFlow, TensorFlow API Hierarchy, Components of tensorflow Tensors and Variables, Getting Started with Google Cloud Platform and Qwiklabs, Lab Intro Writing low-level TensorFlow programs, working in-memory and with files, Training on Large Datasets with tf.data API, Getting the data ready for model training, Embeddings, Lab Intro Manipulating data with TensorFlow Dataset API.	12 Hrs.
UNIT - V	Build a Momentum-based Trading System: Introduction to Momentum Trading, Introduction to Hurst, Building a Momentum Trading Model, Define the Problem, Collect the Data, Creating Features, Split the Data, Selecting a Machine Learning Algorithm, Backtest on Unseen Data, Understanding the Code: Simple ML Strategies to Generate Trading Signal, Lab Intro: Momentum Trading, Momentum Trading Lab Solution. Build a Pair Trading Strategy Prediction Model: Introduction to Pair Trading, Picking Pairs, Picking Pairs with Clustering, implementing a Pair Trading Strategy, Evaluate Results of a Pair Trade, Backtesting and Avoiding Overfitting, Improve Pair Strategy, Lab Intro: Pairs Trading, Lab Solution: Pairs Trading, Kalman Filter Introduction, Kalman Filter Trading Applications.	12 Hrs.

Books Recommended:

- Machine Learning for Algorithmic Trading: Predictive models to extract signals from market and alternative data for systematic trading strategies with Python, by Stefan Jansen

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
5.	BUM-CC-325(A)	Technical Analysis, Methodology & Design of Systematic Trading	100	4	3	1	0	4

Course Objective:

The objectives of this course are to discuss subjective and objective analysis and review how the different types of analysis can be incorporated into trading decisions. Develop complete trading strategies including entry and exit rules, position sizing strategies and risk management techniques. Review how quantitative trading systems can be adapted to suit an individual's personal needs.

UNIT	Contents	Max. Hrs.
UNIT – I	Introduction to Technical Analysis: Technical analysis, Basic assumptions, Strengths and Weakness; Dow Theory, Charts, Candlestick Charts Analysis with One Two and Three Candles Like Hammer, Hanging Man, Shooting Star, Bearish and Bullish	12 Hrs.
UNIT – II	Major Indicators and Oscillators: Stochastic, RSI, Williams %R, MFI, Bollinger bands, Moving Averages, MACD, Other Investments. Major Theories: Efficient Market Hypothesis, Gap Theory, Dow Theory and Eliot Wave Theory	12 Hrs.
UNIT – III	Systematic trading and investing: Introduction, Simple trading rules, sticking to the plan, Good system design, Systematic Trading Rules: Chapter overview, good trading rule, when trading rules don't work, why certain rules are profitable, Classifying trading styles, Achievable Sharpe ratios. Fitting: overview, The perils of over-fitting, Some rules for effective fitting.	12 Hrs.
UNIT – IV	Portfolio Allocation: overview, Optimising gone bad, saving optimisation from itself, making weights by hand, Incorporating Sharpe ratios. Framework: Overview, modular framework, elements of the framework. Instruments: overview, Necessities, Instrument choice and trading style.	12 Hrs.
UNIT – V	Forecasts: overview, good forecast, Discretionary trading with stop losses, the asset allocating investor's 'no-rule' rule, two example systematic rules, Adapting and creating trading rules, Selecting trading rules and variations. Combined Forecasts: overview, combining with forecast weights, Choosing the forecast weights 126 Getting to 10, Capped at 20. Speed and Size: overview, Speed of trading, Calculating the cost of trading, using trading costs to make design decisions, Trading with more or less capital, Determining overall portfolio size, Summary of tailoring systems for costs and capital.	12 Hrs.

Books Recommended:

- Systematic Trading: A unique new method for designing trading and investing systems. by Robert Carver

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
6.	BUM-CC-326(A)	Future Trends in Algorithmic Trading	100	4	3	1	0	4

Course Objective:

The objectives of this course are to get familiar with the global contexts and future perspective in Algorithmic trading.

UNIT	Contents	Max. Hrs.
UNIT – I	AI/ML-based selection of dynamic parameters, Real-time integration between algos and Transaction Cost Analysis (TCA), Pre-trade recommendations for better insight into performance	12 Hrs.
UNIT – II	Formulate a view on the relationship between emerging technologies trading and the future of systematic, Algos to take more prominence across multiple asset-classes, Algo usage for more automation and efficiency.	12 Hrs.
UNIT – III	Execution Management Systems (EMS): Automated Trading, Adaptive Algo Engine, Smart Order Routing, Internalisation, Equities, FX, Derivatives and OMS integration. Adaptive Market Making (MM) Technology: FX Market- Making, ETF & Cash liquidity providing, Simple option Market-Making	12 Hrs.
UNIT – IV	Order Management System (OMS): Cross-asset position management and real-time P&L calculations for proprietary trading and client activity, Care management for high touch trading (which can be alongside a low touch operations), with hierarchical/collaborative and global order management, Advanced trading/OMS for Basket and ETF/List trading (with native support for algorithmic trading)	12 Hrs.
UNIT – V	Smart Order Routing (SOR): Best Execution, Compliance & Strategic Execution, using in-depth analysis such as the venues performance, or the cost of trading (or spread capture). TCA and Best Execution Reporting: Order lifecycle, Detailed and step-by-step decision- making process, Context of each decision, relevant benchmarks, such as Slippage, Calculated VWAP and Spread-capture, determine the execution performance.	12 Hrs.

Books Recommended:

- Algorithmic Trading and DMA: An Introduction to Direct Access Trading Strategies by Barry C. Johnson

Semester - IV	
BUM-CC-421(A)	Working Strategy and Ideation
BUM-CC-422(A)	Live Algorithmic Trading Practical with Various Software.
BUM-CC-423(A)	Practices Under Practicians and Domain Experts
BUM-CC-424(A)	Project Work.

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
1.	BUM-CC-421(A)	Working Strategy and Ideation	100	4	3	0	1	4
2.	BUM-CC-422(A)	Live Algorithmic Trading Practical with Various Software	100	4	1	0	3	4
3.	BUM-CC-423(A)	Practices Under Practicians and Domain Experts	100	4	0	0	4	4
4.	BUM-CC-424(A)	Project Work	100	4	0	0	4	4
Total			400	16	4	0	12	16

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
1.	BUM-CC-421(A)	Working Strategy and Ideation	100	4	3	0	1	4

Course Objective:

Basic understanding of Creativity and idea generation.

UNIT	Contents	Max. Hrs.
UNIT – I	Spotting the sources for technical trading ideas: Classifications of technical trading ideas by their applications domain, Classifications of technical trading ideas by trading frequency and required infrastructure, Classifications of technical trading ideas by types of market participants and use them.	12 Hrs.
UNIT – II	Spotting the sources for fundamental trading ideas: Macro-economic indicators and their meaning, corporate and sector reporting activity, interest rates and their impact.	12 Hrs.
UNIT – III	Concept & Classification of Technology and its management, Critical Parameters in managing Technology, Technology life cycle, innovation & Technology, Process of Technological & Non-Technological Innovation, types of innovation.	12 Hrs.
UNIT – IV	Condition for idea generation and innovation fertilization, Research & development (R&D), Management Innovation and firm capability	12 Hrs.
UNIT – V	Technology Transfer & Legal frame/IPR/ Patents/copy rights/cyber law etc. Competitiveness of Firm/ industry, a Nation Technology.	12 Hrs.

Books Recommended:

- Lifelong Creativity An Unending Quest- Pradip N Khandwalla, McGraw Hill(2003).
- Management of Technology The Key to Competitiveness and Wealth Creation -McGraw Hill

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
2.	BUM-CC-422(A)	Live Algorithmic Trading Practical with Various Software	100	4	1	0	3	4

Course Objective:

UNIT	Contents	Max. Hrs.
UNIT – I	Pick the Right Algorithmic Trading Software: A Quick Primer on Algorithmic Trading Softwares, Users of Algorithmic Trading Software, Algorithmic Trading Software: Build or Buy, The Key Features of Algorithmic Trading Software	12 Hrs.
UNIT – II	Analysing the Softwares on the basis of followings: Availability of Market and Company Data, Connectivity to Various Markets, Latency, Configurability and Customization, Functionality to Write Custom Programs, Backtesting Feature on Historical Data, Integration With, Trading Interface, Plug-n-Play Integration	12 Hrs.
UNIT – III	Software and algo trading platforms in India, Software for algo trading in NSE, How NSE helps to accommodate automated trading software, Advantages and disadvantages of softwares.	12 Hrs.
UNIT – IV	Backtesting Software: Alpha architect, DELTIX, QuantHouse, SmartQuant, Qontigo	12 Hrs.
UNIT – V	Live trading Practical Sessions using following Softwares: Zerodha streak, Zerodha AlgoZ, AlgoTraders, RoboTrade, Robotrader, TradeTron Tech, Omnesys Nest, ODIN, Metatrader, Algonomics	12 Hrs.

Books Recommended:

- Algorithmic Trading and DMA: An Introduction to Direct Access Trading Strategies by Barry C. Johnson

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
3.	BUM-CC-423(A)	Practices Under Practicians and Domain Experts	100	4	0	0	4	4

Course Objective:

The Paper shall be based on various practical Exercises which, shall comprise of tutorial work, carry home tasks, case competition, workshops presentation, Practical assignments, company studies, project assignment etc. The weight-age of these items will be announced by the teachers concerned in consultation with the Professor & Head/Dean. The selected Practical shall be from the all subjects that are being taught or any other general topic of Practical importance. Marks may be awarded on the basis of total performance of the examinees, for which the scheme of examination and evaluation shall be (40+60) marks. The evaluation is to be made internally out of 40 marks and externally out of 60 marks which will be for project work.

Students are supposed to update knowledge with the Experience and hands on training Under Practicians and Domain Experts in the classroom session. Visiting Faculty/Consultants/Experts add to new knowledge to which the students should acquaint themselves with. Workshops, training sessions and Seminars are the additional sources of knowledge

S. No.	Course Code	Course Title	Max. Marks	Credits	Distribution of Credits			
					L	T	P	C
4.	BUM-CC-424(A)	Project Work	100	4	0	0	4	4

Course Objective:

Students are divided into groups with complementing background and expertise. Each group is expected to conceive a quantitative trading strategy, do necessary research, and develop a functional strategy model that is back tested and simulated/optimized over appropriate data. The instructor will coordinate the formation of the groups, facilitate the trading strategy idea selection process based on students' interest and resource limitations, and guide the groups in the development process. Each group will present their strategy, and related results and findings with the rest of the class in a final presentation. Intermediary updates are also expected in front of the class and the instructor.