COURSE TITLE	**ALGOTRADING USING PYTHON**
COURSE CODE	**05MF0305**
COURSE CREDITS	**4**

Objective:

1. Understand the fundamentals of algorithmic trading, including key strategies and market micro-structure.
2. Develop Python-based trading systems using financial data analysis and visualization techniques.
3. Implement technical analysis indicators and integrate machine learning for predictive trading.
4. Apply algorithmic trading strategies in real-world financial market through case studies and live trading simulations.

Course Outcomes: After completion of this course, student will be able to:

1. Demonstrate knowledge of market microstructure, risk management, and AI-driven trading strategies.
2. Utilize Python libraries for financial data analysis, backtesting, and API-based live trading.
3. Implement and evaluate technical indicators such as moving averages, candlestick patterns, and momentum indicators.
4. Develop and test algorithmic trading strategies using machine learning models in financial markets.

Pre-requisite of course: Fundamental of Python Programming

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Algorithmic Trading** Basics of Algo Trading, Market Microstructure, Key Trading Strategies, Risk Management in Algo Trading, Role of AI in Trading, Case Study: HFT Firms	8
2	**Python for Trading** Pandas for Financial Data, Matplotlib for Visualization, Backtesting Strategies, API-based Live Trading, Machine Learning in Trading, Automated Portfolio Management	10

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Contents : Unit	Topics	Contact Hours
3	**Technical Analysis in Trading** Moving Averages & Indicators, Candlestick Patterns Analysis, Trend & Momentum Indicators, Volatility & Risk Metrics, Implementing Trading Algorithms	12
4	**Case Studies & Real-world Trading** Algo Trading in Stock Markets, Machine Learning for Predictive Trading, Risk & Compliance in Algo Trading, Case Study: Predicting Stock Prices using AI	15
Total Hours		**45**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**unit 1** Backtesting a Simple Trading Strategy: Implement a basic moving average crossover strategy using Python, Understanding Market Microstructure: Analyze market orders, bid-ask spreads, and slippage using real trading data.	15
2	**unit 2** Loading and Visualizing Financial Data: Use Pandas & Matplotlib to analyze stock price trends, Building a Simple Trading Bot: Fetch live stock prices using an API (Alpha, Yahoo Finance) and execute simulated trades.	15
3	**unit 3** Implementing MACD and RSI Indicators: Develop a Python program to calculate MACD & RSI and generate buy/sell signals, Candlestick Pattern Recognition: Detect common patterns (Doji, Engulfing, Hammer) and visualize them using Matplotlib.	15
4	**unit 4** Developing an Automated Trading Strategy: Implement a MACD-based Auto Buy/Sell Algorithm and backtest it on historical data, Risk Management & Portfolio Optimization: Use Machine Learning to predict stock price movements and optimize asset allocation.	15
Total Hours		**60**

Textbook :

1 Advances in Financial Machine Learning, Marcos López de Prado, Wiley, 2018

2 Algorithmic Trading: Winning Strategies and Their Rationale, Ernie Chan, Wiley, 2013

References:

1 Python for Algorithmic Trading: From Idea to Cloud Deployment, Python for Algorithmic Trading: From Idea to Cloud Deployment, Yves Hilpisch, O'Reilly Media, 2020

2 Machine Learning for Asset Managers, Machine Learning for Asset Managers, Marcos M. López de Prado, Cambridge University Press, 2020

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Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

1 Demo
2 Practical
3 Boardwork

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