- **Sem.**   3
- **Subject Code**   : 05MF0305
- **Subject**   : AlgoTrading using Python
- **Course Objectives**   : Students will be able :

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.

- **Prerequisites**   : Fundamental of Python Programming.

Unit No	Topics Covered	No of Hours.
1	**Unit 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	08
2	**Unit 2: Python for Trading** ▪ Pandas for Financial Data ▪ Matplotlib for Visualization ▪ Backtesting Strategies	10

	▪ API-based Live Trading ▪ Machine Learning in Trading ▪ Automated Portfolio Management	
3	**Unit 3: Technical Analysis in Trading** ▪ Moving Averages & Indicators ▪ Candlestick Patterns Analysis ▪ Trend & Momentum Indicators ▪ Volatility & Risk Metrics ▪ Implementing Trading Algorithms	**12**
4	**Unit 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**

Course Outcomes:

▪ Demonstrate knowledge of market microstructure, risk management, and AI-driven trading strategies.

▪ Utilize Python libraries for financial data analysis, backtesting, and API-based live trading.

▪ Implement and evaluate technical indicators such as moving averages, candlestick patterns, and momentum indicators.

▪ Develop and test algorithmic trading strategies using machine learning models in financial markets.

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Course Outcomes – Program Outcomes Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1							M	H
CO2							L	H

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO3							M	M
CO4						M	M	

Reference Books:

- "Advances in Financial Machine Learning" – Marcos López de Prado

- "Algorithmic Trading: Winning Strategies and Their Rationale" – Ernie Chan

- "Python for Algorithmic Trading" – Yves Hilpisch

- "Machine Learning for Asset Managers" – Marcos López de Prado

Web References :

App References :

Syllabus Coverage from text /reference book & web/app reference:

Unit #	Chapter Numbers

PRACTICALS

Unit No	List of Practical	No of Hours
1	Practical: • 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.	60
2	Practical: • 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 (Alpaca, Yahoo Finance) and execute simulated trades.	
3	Practical: • 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.	
4	Practical: • 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.	