

EE6627: QUANTITATIVE FINANCE: PRINCIPLES AND APPLICATIONS

Effective Term

Semester A 2026/27

Part I Course Overview

Course Title

Quantitative Finance: Principles and Applications

Subject Code

EE - Electrical Engineering

Course Number

6627

Academic Unit

Electrical Engineering (EE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Precursors

MA2001 Multi-variable Calculus and Linear Algebra

Part II Course Details

Abstract

This course aims to introduce students from science and engineering backgrounds to the quantitative methods and techniques applicable in the field of finance. The course will cover a wide range of topics, including financial markets, asset pricing models, portfolio optimization, derivative pricing, and quantitative trading.

Prior exposure to linear algebra, probability theory, and programming would be required for students to fully engage with the technical content of this course. Prior exposure to basic finance concepts would be beneficial but not mandatory.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Analyse the core concepts of risk aversion and the capital asset pricing model (CAPM), and explain their significance in financial decision-making.		x		
2	Critically examine the efficient market hypothesis and discuss the impact of behavioral biases on financial markets and investor decision-making.		x		
3	Demonstrate the ability to apply quantitative techniques for portfolio optimization and construct efficient investment portfolios.		x	x	
4	Comprehend and evaluate the pricing models for forward and futures contracts, and explain their role in financial risk management.		x	x	
5	Understand and apply the key pricing models for options contracts, and assess their use in hedging and speculative strategies.		x	x	x

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Theoretical foundations of risk aversion, CAPM, efficient market hypothesis, and behavioural biases in finance; pricing models for forward, futures, and options contracts, including their mathematical underpinnings.	1, 2, 3, 4, 5	2 hours / week (for 13 weeks)

2	Tutorial	Guided problem-solving exercises and workshops; (optional) hands-on sessions applying programming tools with financial data.	3, 4, 5	1 hour / week (for 13 weeks)
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Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Assignments	1, 2, 3, 4, 5	25	-	Yes
2	Mid-term test	1, 2, 3, 4, 5	25	-	No

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

To pass the course, students are required to achieve at least 30% in course work and 30% in the examination.

Assessment Rubrics (AR)**Assessment Task**

Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Achievements in CILOs

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal level

Assessment Task

Coursework (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Achievements in CILOs

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal level

Assessment Task

Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Achievements in CILOs

Excellent

(A+, A, A-) High

Good

(B+, B) Medium

Marginal

(B-, C+, C) Low

Failure

(F) Not even reaching marginal level

Assessment Task

Coursework (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Achievements in CILOs

Excellent

(A+, A, A-) High

Good

(B+, B) Medium

Marginal

(B-, C+, C) Low

Failure

(F) Not even reaching marginal level

Additional Information for AR**Constructive Alignment with Programme Outcomes**

PILO 2: Demonstrate a comprehensive understanding of fundamental financial theories and their real-world applications. Develop a critical mindset to question assumptions and challenge conventional financial paradigms. Integrate knowledge of behavioral finance to enhance decision-making in complex, ambiguous financial situations.

PILO 3: Utilize advanced quantitative and computational skills to solve complex financial problems. Apply portfolio management principles to design and implement investment strategies.

PILO 4,5: Understand and apply various financial instruments and derivatives for risk mitigation and hedging. Demonstrate proficiency in the valuation and risk management of financial derivatives.

PILO 6: Communicate technical financial concepts effectively to both financial and non-financial stakeholders.

Part III Other Information**Keyword Syllabus**Introduction to the Course

Financial Markets and Instruments, Risk Aversion, Portfolio Theory, Efficient Market Hypothesis, Behavioral Finance, Stock Market, Forward Contracts, Futures Contracts, Options, Asset Management, Time Series Analysis

Risk Aversion and Capital Asset Pricing Model (CAPM)

Expected utility theory, Risk-averse preferences, Mean-variance optimization, Systematic risk, Beta coefficient, Security market line (SML), Efficient frontier

Efficient Market Hypothesis and Behavioral Finance

Strong, semi-strong, and weak form efficiency, Random walk hypothesis, Heuristics and biases, Prospect theory, Anchoring and framing effects, Overconfidence and overreaction

Portfolio Optimization Techniques

Modern portfolio theory, Mean-variance optimization, Markowitz model, Sharpe ratio, Constrained optimization, Portfolio rebalancing

Pricing of Forward and Futures Contracts

Arbitrage-free pricing, Cost-of-carry model, Convenience yield, Basis risk, Hedging strategies, Margin requirements

Pricing of Options Contracts

Black-Scholes-Merton model, Binomial option pricing model, Implied volatility, Greeks (delta, gamma, theta, vega)

Reading List**Compulsory Readings**

Title	
1	Thomas Mazzoni: A First Course in Quantitative Finance

Additional Readings

Title	
1	John Hull: Options, Futures, and Other Derivatives