SYE6103: FINANCIAL ENGINEERING FOR ENGINEERING MANAGERS

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Financial Engineering for Engineering Managers

Subject Code

SYE - Systems Engineering

Course Number

6103

Academic Unit

Systems Engineering (SYE)

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

Prerequisites

Nil

Precursors

Basic statistics knowledge equivalent to that of typical undergraduate science/engineering students

Equivalent Courses

SEEM6103 Financial Engineering for Engineering Managers (offered until 2021/22) / ADSE6103 Financial Engineering for Engineering Managers (offered until 2023/24)

Exclusive Courses

Nil

Part II Course Details

Abstract

This course introduces the essential aspects of financial engineering to engineering management students. No prior background in finance is assumed. The topics of the course include: a brief review of basic probability and statistics; introduction to time series models; calculation of investment returns; portfolio theory; the Capital Asset Pricing model; option pricing; value-at-risk; and real options valuation. The students will learn to apply the financial engineering tools to aid managerial decision making and managing risk in engineering enterprises.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain the role of financial engineering in an engineering enterprise.	5	x		
2	Perform basic probability and statistics calculations relevant to financial engineering. Apply basic time series models such as AR, MA, ARMA and ARIMA to fit time series data.	20	x	x	
3	Compute net returns, gross returns, log returns. Describe the returns using the random walk model. Apply basic portfolio theory to design portfolio with given desired characteristics. Apply the Capital Asset Pricing model to compute fundamental parameters, including the beta and the expected return of a portfolio.	20	x	x	
4	Apply the binomial tree model and the Black-Scholes formula to determine the price of a European option.	20	x	x	
5	Estimate the value-at-risk of a portfolio.	20	x	x	
6	Apply the financial engineering tools such as the Capital Asset Pricing model, the binomial tree model, and value-at-risk to aid making managerial decisions and managing risk in engineering enterprises.	15	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 and in-class discussions	Lectures, in-class exercises, in-class Q&A and discussions	1, 2, 3, 4, 5, 6	39 hours/sem

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Coursework (Assignments and a Term Project/Presentation)	1, 2, 3, 4, 5, 6	50	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination should be obtained.

Assessment Rubrics (AR)

Assessment Task

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

Criterion

Based on submitted written work to evaluate understanding of subject matter, evidence of knowledge base, capacity to analyse and synthesize, and evidence of original and critical thinking.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Coursework (Assignments and a Term Project / Presentation) (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Based on submitted written work and oral presentation to evaluate understanding of subject matter, evidence of knowledge base, capacity to analyse and synthesize, and evidence of original and critical thinking.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

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

Criterion

Based on submitted written work to evaluate understanding of subject matter, evidence of knowledge base, capacity to analyse and synthesize, and evidence of original and critical thinking.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate/Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Coursework (Assignments and a Term Project / Presentation) (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Based on submitted written work and oral presentation to evaluate understanding of subject matter, evidence of knowledge base, capacity to analyse and synthesize, and evidence of original and critical thinking.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate/Basic

Failure

(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

· Review of basic probability and statistics. Introduction to time series models.
· Calculation of investment returns. Random walk model of returns.
· Portfolio theory. The Capital Asset Pricing model.
· Option pricing with the binomial tree model and the Black-Scholes formula.
· Value-at-risk calculation.
· Managerial decision making and risk management in engineering enterprises using financial engineering tools.

Reading List

Compulsory Readings

	Title
1	Investments, 9th Edition, Z. Bodie, A. Kane and A. Marcus, McGraw-Hill.

Additional Readings

	Title
1	Modeling Risk, 2nd Edition, J. Mun, John Wiley & Sons.
2	Investment Science, D. G. Luenberger, Oxford University Press.
3	Analysis for Financial Management, 10th Edition, Robert C. Higgins, McGraw-Hill
4	A Course in Financial Calculus, A. Etheridge, Cambridge University Press.
5	Statistics and Finance: An Introduction, David Ruppert. Springer