

PHY5507: PHYSICAL METHODS IN FINANCIAL DATA MODELLING

Effective Term

Semester A 2026/27

Part I Course Overview

Course Title

Physical Methods in Financial Data Modelling

Subject Code

PHY - Physics

Course Number

5507

Academic Unit

Physics (PHY)

College/School

College of Science (SI)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Basic knowledge of statistics, big number theory, normal distribution, and curiosity to finance.

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Additional Information

Nil

Part II Course Details

Abstract

This is a class on the application of knowledge learned from studying physics to the world of finance. Armed with basic understanding of statistics (will be reenforced in the class) and related problem solving methods learned in physics class, we will explore the world of finance. Using derivatives as a tool, financial engineers invent products to help companies and investors manage risk and enhance returns, which also introduces new risks if applied improperly.

As most internship applications start in the fall for campus recruitment, this course provides a primer for students in the Department of Physics who are interested in applying for finance related jobs.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Have basic understanding of mathematical models in finance from physicist's perspective.	20	x	x	
2	Learn the basics of financial instruments and their uses.	40	x	x	
3	Understand the risk of financial instruments.	20	x	x	
4	Learn to use the financial instruments to mitigate different types of risks.	20	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	Lectures	Classroom teaching.	1, 2, 3, 4	2
2	Tutorials	Discussion of real world examples related to the lectures.	1, 2, 3, 4	1
3	Projects and assignments	One project to help students understand the course materials.	1, 2, 3, 4	1

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Assignments	1, 2, 3, 4	20	-	Yes
2	Projects	1, 2, 3, 4	20	-	No
3	Class attendance	1, 2, 3, 4	10	-	No

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

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

Assessment Rubrics (AR)**Assessment Task**

Assignments

Criterion

The student demonstrates a clear understanding of financial modeling concepts and applies physics-based problem-solving techniques to solve assigned problems independently.

Excellent (A+, A, A-)

High (demonstrates exceptional understanding of financial models with creative and accurate solutions)

Good (B+, B, B-)

Significant (shows good understanding with mostly accurate solutions)

Fair (C+, C, C-)

Moderate (demonstrates partial understanding with some accurate solutions)

Marginal (D)

Basic (demonstrates essential understanding with minimal accuracy)

Failure (F)

Not reaching marginal levels

Assessment Task

Projects

Criterion

The student collaborates effectively in a small group to research financial instruments and develop solutions for risk management or return enhancement, supported by physics-based methodologies.

Excellent (A+, A, A-)

High (demonstrates innovative solutions with strong collaboration and accurate application of concepts)

Good (B+, B, B-)

Significant (shows effective collaboration with mostly accurate solutions)

Fair (C+, C, C-)

Moderate (demonstrates some collaboration and partially accurate solutions)

Marginal (D)

Basic (demonstrates minimal collaboration and basic solutions)

Failure (F)

Not reaching marginal levels

Assessment Task

Class Attendance

Criterion

The student consistently attends classes on time, actively engaging in discussions and activities.

Excellent (A+, A, A-)

High (attends $\geq 80\%$ of classes with active participation)

Good (B+, B, B-)

Significant (attends $\geq 70\%$ of classes with consistent participation)

Fair (C+, C, C-)

Moderate (attends $\geq 50\%$ of classes with some participation)

Marginal (D)

Basic (attends $\geq 40\%$ of classes with minimal participation)

Failure (F)

Not reaching marginal levels ($< 40\%$ attendance)

Assessment Task

Examination

Criterion

The student applies knowledge from the course to solve finance-related problems accurately, demonstrating proficiency in financial modeling and risk management techniques.

Excellent (A+, A, A-)

High (solves problems with creativity and high accuracy)

Good (B+, B, B-)

Significant (solves problems with mostly accurate solutions)

Fair (C+, C, C-)

Moderate (solves problems with some accuracy)

Marginal (D)

Basic (solves problems with minimal accuracy)

Failure (F)

Not reaching marginal levels

Part III Other Information

Keyword Syllabus

- Overview of Physics and Finance: Basic Assumptions, model and application. How to approach real life problem using what we learned in physics classes?
- Forecasting future in an uncertain world: Random Walk, and Brownian motion, and binomial model.
- Option theory and financial derivatives pricing.
- Financial instruments: Foreign exchange and interest rate products.
- Financial instruments: Equity and equity options.
- Financial instruments: commodity and commodity derivatives.
- Legal aspect of financial instruments: Hong Kong SFC licensing rules and margin financing.
- Counterparty credit risk of derivative products.
- Mitigating credit risks and managing new risks, ISDA and CSA.
- Enterprise Risk Management and economic capital.
- Helping companies to manage risk: Commodity and fx hedging.
- Conclusion: What can physicist contribute to Finance, and how to be a good finance engineer?

Reading List

Compulsory Readings

Title	
1	Nil

Additional Readings

Title	
1	Douglas W. Hubbard, “How to Measure Anything: Finding the Values of Intangibles in Business” , Wiley; 3rd edition, 2014
2	Frank J. Fabozzi, “The Handbook of Fixed Income Securities” , McGraw-Hill Education, 8th Edition, 2012.
3	John Hull, “Options, Futures, and Other Derivatives” , Pearson, 10th Edition, 2017.
4	John Hull, “Risk Management and Financial Institutions” , Wiley; 5th Edition, 2018