

PHY3220: FROM PHYSICS TO FINANCE

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

From Physics to Finance

Subject Code

PHY - Physics

Course Number

3220

Academic Unit

Physics (PHY)

College/School

College of Science (SI)

Course Duration

One Semester

Credit Units

3

Level

B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

PHY1101 Introductory Classical Mechanics or
AP1201/PHY1201 General Physics I*

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Additional Information

* This pre-requisite requirement is waived for Advanced Standing I students and Advanced Standing II students.

Part II Course Details

Abstract

This is an introductory class on the application of knowledge learned from studying physics to the world of finance. Armed with basic understanding of statistics (will be reinforced in the class) and related problem solving methods learned in physics, we will explore the world of financial engineering. Using derivative as a tool, financial engineers invent products to help companies and investors manage risk and enhance returns, which also introduce new risks if applied improperly. As most internship applications start in the fall of year 3 for undergraduate students, this course provides a primer for students at physics department 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 a physicist's perspective.	20	x	x	
2	Learn the basics of financial instruments and their use.	40	x	x	
3	Understand the risks of financial instruments from a physicist's perspective.	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	2 projects to help students understand the course materials.	1, 2, 3, 4	1

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3, 4	20	
2	Projects	1, 2, 3, 4	20	
3	Class attendance	1, 2, 3, 4	10	

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 must be obtained

Assessment Rubrics (AR)**Assessment Task**

1. Assignments

Criterion

Demonstrate understanding of basic concepts and solve assigned problems independently

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

2. Projects

Criterion

Ability to work in a small group to research the issue and work out a solution together.

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

3. Class Attendance

Criterion

Attending class on time

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

4. Examination

Criterion

Ability to solve finance related problems using the knowledge learned from the class.

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

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