

**City University of Hong Kong
Course Syllabus**

**offered by School of Data Science
with effect from Semester A 2021/22**

Part I Course Overview

Course Title: AI in Systematic Trading

Course Code: SDSC4018

Course Duration: One Semester

Credit Units: 3

Level: B4

- Arts and Humanities
 Study of Societies, Social and Business Organisations
 Science and Technology

Proposed Area:
(for GE courses only)

Medium of Instruction: English

Medium of Assessment: English

Prerequisites:
(Course Code and Title) Nil

Precursors:
(Course Code and Title) Nil

Equivalent Courses:
(Course Code and Title) Nil

Exclusive Courses:
(Course Code and Title) Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course offers students the review of financial systems as well as machine learning, artificial intelligence, and optimization techniques utilized in nowadays financial fields. Students will obtain technical knowledge in collecting a variety of financial data, developing trading algorithms, and optimizing overall portfolio performance. The goal of this course is to help student establish a clear map of frameworks for developing the artificial intelligence serving financial systems.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs [#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Review important concepts in financial systems.	10%	√		
2.	Introduce methods, algorithms, and techniques in machine learning, artificial intelligence, and optimization utilized in modern financial systems.	30%	√		
3.	Familiarize the framework of integrating knowledge in machine learning, artificial intelligence, and optimization to construct intelligence for financial systems.	30%	√	√	
4.	Develop artificial intelligence tools to generate trading strategies, manage financial risk, optimize investment portfolios, and design and value financial products	30%	√	√	
		100%			

* If weighting is assigned to CILOs, they should add up to 100%.

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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 self-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.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lectures and in-class discussions	Lectures, in-class exercises, in-class Q&A and discussions will be used to implement CILOs 1-4.	√	√	√	√	26 hours/semester
Tutorials	A term project will be given to students. In the term project, students will apply the financial tools discussed in the course to practical problems in financial engineering.		√	√	√	13 hours/semester

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.				Weighting*	Remarks
	1	2	3	4		
Continuous Assessment: <u>40%</u>						
Assignments	√	√	√		10%	
Project		√	√	√	30%	
Examination: <u>60%</u> (duration: 2 hours)						
Examination	√	√	√	√	60%	
					100%	

*The weightings should add up to 100%.

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

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignments	Submitted written work	For all 4 CILOs, strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.	For at least 3 out of 4 CILOs, evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.	For at least 3 out of the 4 CILOs, evidence that student is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material	For at least 3 out of the 4 CILOs, sufficient familiarity with the subject matter to enable the student to progress without repeating the course.	Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant use of literature.
2. Project	Project presentation	For all 4 CILOs, strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.	For at least 3 out of 4 CILOs, evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.	For at least 3 out of the 4 CILOs, evidence that student is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material	For at least 3 out of the 4 CILOs, sufficient familiarity with the subject matter to enable the student to progress without repeating the course.	Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant use of literature.
3. Examination	Submitted written work	For all 4 CILOs, strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.	For at least 3 out of 4 CILOs, evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.	For at least 3 out of the 4 CILOs, evidence that student is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material	For at least 3 out of the 4 CILOs, sufficient familiarity with the subject matter to enable the student to progress without repeating the course.	Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant use of literature.

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

- Review of financial systems;
- Trading systems
- Financial data collection and processing
- Machine learning in developing trading algorithms
- Artificial intelligence in supervising financial systems
- Portfolio theory
- Optimization methods in trading and investment
- Robo-Advisors.

2. Reading List

2.1. Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Lecture notes and slides provided by the instructor
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2.2. Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Essentials of Investments, Z. Bodie, A. Kane and A. Marcus, 9th Edition, McGraw-Hill 2013
2.	Artificial Intelligence; A Modern Approach, S. J. Russel and P. Norvig, 3 rd Edition, Prentice Hall, 2009
3.	Investment Science, D. G. Luenberger, Oxford University Press.
4.	Financial Markets and Institutions, Frederic S. Mishkin and Stanley G. Eakins, 8 th Edition, Pearson International, Prentice Hall, 2015