

**City University of Hong Kong
Course Syllabus**

**offered by Department of Systems Engineering
with effect from Semester A 2024 / 25**

Part I Course Overview

Course Title:	<u>Managerial Decision-making Systems with Artificial Intelligence</u>
Course Code:	<u>SYE6102</u>
Course Duration:	<u>One Semester</u>
Credit Units:	<u>3</u>
Level:	<u>P6</u>
Medium of Instruction:	<u>English</u>
Medium of Assessment:	<u>English</u>
Prerequisites: <i>(Course Code and Title)</i>	<u>Nil</u>
Precursors: <i>(Course Code and Title)</i>	<u>Students are expected to have either some working experience in management or taken management equivalent course(s)</u>
Equivalent Courses: <i>(Course Code and Title)</i>	<u>SEEM6102 Managerial Decision-making Systems with Artificial Intelligence (offered until 2021/22)/ ADSE6102 Managerial Decision-making Systems with Artificial Intelligence (offered until 2023/24)</u>
Exclusive Courses: <i>(Course Code and Title)</i>	<u>Nil</u>

Part II Course Details

1. Abstract

The aim of the course is to develop a generic understanding on the process and criteria of a manager in making a proper decision. Students will learn the concept and technique of artificial intelligence (AI) on how it can aid and enhance the process in making managerial decision. By completing this course, the students will have a general understanding on AI and its usefulness in helping the managers to make appropriate decisions.

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.	Understand the process, criteria and procedures in making managerial decisions and policies;	10%	✓		
2.	Recognize the structures, the representations of knowledge, and the algorithms of various types of existing AI-based approaches;	50%	✓		
3.	Analyze the effectiveness and limitations of AI-based approaches in managerial decision-making processes;	10%		✓	
4.	Design an AI-based decision-making system for a selected industrial case or process	30%		✓	
		100%			

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.

3. Learning and Teaching Activities (LTAs)

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

LTA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	Lectures have 24 hours. The content of lectures will roughly follow the topics covered in the Section of Keyword Syllabus with case studies for illustration purpose.	✓	✓	✓	✓	33 hours/sem
Final Project Presentation (large class)	It includes the show case of samples of term project and a presentation to highlight the achievement of the term project. To accomplish these activities, the students will form groups with a size of around 3 students per group. Duration the course, a term project, which focused on CILOs 3 and 4, must be accomplished by each group. For the term project, the students are required to design an automatic managerial decision-making system using the learned AI techniques to replace the existing conventional or manual decision-making system. The AI-based system will be compared to the manual system in their efficiency and accuracy in making decisions, resource requirements and cost effectiveness. A group report to describe the structure and the expected achievements of the designed system must be submitted. A presentation will be held to report and demonstrate the student achievements in the term project so that comments can be given to further improve the designed managerial decision-making system.			✓	✓	6 hours/sem

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>50</u> %						
Assignments	✓	✓	✓		10%	
Mid-term Exam	✓	✓	✓		20%	
Final Project and it's Presentation and Report				✓	20%	
Examination: <u>50</u> % (duration: 2 hours, if applicable)						
					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.)

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignments	Individual assignments to deepen the understanding of course materials.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Mid-term Exam	Gain a solid understanding of theories behind AI algorithms in the applications of making managerial decisions and policies.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Final Project and its Presentation and Report	The assessment of the final project will include the understanding of the problems, the appropriateness of suggested methods to the given problems, the suitability of the automatic managerial decision-making system for a given industrial problem.	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Final Exam	Students acquire the basics of artificial intelligence (AI) and how it can aid and enhance the process in making managerial decision. Gain the understanding on AI and its usefulness in helping the managers to make appropriate decisions.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Assignments	Individual assignments to deepen the understanding of course materials.	High	Significant	Moderate/Basic	Not even reaching marginal levels
2. Mid-term Exam	Gain a solid understanding of theories behind AI algorithms in the applications of making managerial decisions and policies.	High	Significant	Moderate/Basic	Not even reaching marginal levels
3. Final Project and its Presentation and Report	The assessment of the final project will include the understanding of the problems, the appropriateness of suggested methods to the given problems, the suitability of the automatic managerial decision-making system for a given industrial problem.	High	Significant	Moderate/Basic	Not even reaching marginal levels
4. Final Exam	Students acquire the basics of artificial intelligence (AI) and how it can aid and enhance the process in making managerial decision. Gain the understanding on AI and its usefulness in helping the managers to make appropriate decisions.	High	Significant	Moderate/Basic	Not even reaching marginal levels

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.)

- Process in making a decision.
- Human brain's structure, functions and procedures in making a decision.
- Criteria and constraints of managers in making decision.
- Definition, architecture and role of AI techniques
- Traditional AI techniques such as linear regression and logistic regression
- Deep learning techniques including fully connected neural network and CNN
- Comparison of conventional methods and AI in decision making systems
- Design criteria and performance evaluation methods
- Types of existing tool for developing AI-based system
- Decision-making using Reinforcement Learning
- Design and Development of AI-based automatic decision-making systems

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.)

NIL

2.2 Additional Readings

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

1.	Bojadziev G. and Bojadziev M., <i>Fuzzy Logic for Business, Finance and Management</i> , World Scientific Co. Ltd.
2.	Trippi R. and Turban E., <i>Neural Networks in Finance and Investment: Using Artificial Intelligence to Improve Real-World Performance</i> , Probos Publishing Co.
3.	Koller G., <i>Risk Assessment and Decision Making in Business and Industry</i> , CRC Press, USA.
4.	Meredith J.R. and Mantel S.J. Jr., <i>Project Management – A Managerial Approach</i> , John Wiley & Sons, Inc., 3 rd Ed..
5.	Fishman M., Barr D. and Loick W., <i>Using Neural Networks in Market Analysis, Technical Analysis</i> .
6.	Skapura D., <i>Building Neural Networks</i> , Addison Wesley Co.
13.	Maintenance Management (video recording, 9 records), TS192.M345/pt.1-9