City University of Hong Kong
Course Syllabus

offered by Department of Computer Science
with effect from Semester A 2022/23

Part I Course Overview

Course Title:	Artificial Intelligence
Course Code:	CS5491
Course Duration:	One semester
Credit Units:	3 credits
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	CS3334 Data Structures or CS4335 Design and Analysis of Algorithms, or equivalent
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

This course introduces algorithms and techniques in artificial intelligence, with particular emphasis on reasoning in uncertain environments and machine learning with human feedback and/or limited training examples. The topics include AI-based searching algorithms, reinforcement learning, knowledge representation, uncertainty reasoning, planning and acting. The list of topics aims to provide first-principles understanding of modern AI applications including computer game, robotics and natural language processing.

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.	Solve problems by searching algorithms			✓	
2.	Describe and apply reinforcement learning for real-world problems.			✓	
3.	Perform inference by knowledge representation and uncertain reasoning.			✓	
4.	Assess the effectiveness of artificial intelligence for modern applications.		✓	✓	✓
		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 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	
Lecture	The lecture will focus on the introduction of main concepts and technologies used in modern AI applications.	✓	✓	✓	✓	2 hours/week
Tutorial	Students will work on a different problem set each week during the tutorial sessions, through which they can discover the main characteristics of different AI techniques and integrate them for real-world problems. They will also be invited to present their solutions, and the class will be encouraged to provide comments.	✓	✓	✓	✓	1 hour/week
Assignments	Students will implement selected algorithms, apply these approaches to real-world problems, and interpret the results. In this way, students can analyse the performance of different approaches.	✓	✓	✓		
Mid-term test	Mid-term test aims to test the basic understanding of AI algorithms in searching and reasoning.	✓	✓	✓		
Final Exam	Final exam will include questions to assess the capability of students 1) to perform algorithms for specific AI problems; 2) to perform critical evaluation of different approaches; 3) to modify or design algorithms for challenging AI applications.	✓	✓	✓	✓	

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: 50%							
Assignment 1	✓	✓	✓			15%	Expect to include both programming elements and/or mathematical proof.
Assignment 2	✓	✓	✓			15%	Expect to include both programming elements and/or mathematical proof.
Mid-term test	✓	✓	✓			20%	
Examination: 50% (duration: 2 hours)							
Final Exam	✓	✓	✓	✓		50%	
						100%	

^ For a student to pass the course, at least 30% of the maximum mark for the examination must 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 in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Assignment 1	The ability to implement and assess the effectiveness of uncertainty reasoning and search algorithms.	Significant	Moderate	Basic	Not even reaching marginal level
2. Assignment 2	The ability to implement and assess the effectiveness of different reinforcement learning algorithms.	Significant	Moderate	Basic	Not even reaching marginal level
3. Mid-term test	The ability to understand AI concepts/algorithms and apply them for problem solving.	Significant	Moderate	Basic	Not even reaching marginal level
4. Examination	The extent to which the students can understand the algorithms and techniques, apply them with appropriate modification or design new solutions for different applications, and evaluate their performances.	Significant	Moderate	Basic	Not even reaching marginal level

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignment 1	The ability to implement and assess the effectiveness of uncertainty reasoning and search algorithms.	High	Significant	Moderate	Basic	Not even reaching marginal level
2. Assignment 2	The ability to implement and assess the effectiveness of different reinforcement learning algorithms.	High	Significant	Moderate	Basic	Not even reaching marginal level
3. Mid-term test	The ability to understand AI concepts/algorithms and apply them for problem solving.	High	Significant	Moderate	Basic	Not even reaching marginal level
4. Examination	The extent to which the students can understand the algorithms and techniques, apply them with appropriate modification or design new solutions for different applications, and evaluate their performances.	High	Significant	Moderate	Basic	Not even reaching marginal level

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.)

Searching: uninformed search, heuristic search, adversarial search

Knowledge and reasoning: first-order logic, inference, planning, knowledge representation

Reinforcement learning: state-space, model-based/policy-based/value-based algorithms, robotics

Uncertainty: belief networks, probabilistic reasoning, reasoning over time, stochastic simulation

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.	Stuart Russel and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 3rd edition, Pearson Education Limited, 2009.
2.	David Poole, Alan Mackworth, *Artificial Intelliegnce: Foundations of Computational Agents*, 2nd edition, Cambridge University Press, 2017.

2.2 Additional Readings

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