

**City University of Hong Kong  
Course Syllabus**

**offered by Department of Computer Science  
with effect from Semester B 2018/19**

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**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:** CS3334 Data Structures or  
(Course Code and Title) CS4335 Design and Analysis of Algorithms, or equivalent

**Precursors:** Nil  
(Course Code and Title)

**Equivalent Courses:** Nil  
(Course Code and Title)

**Exclusive Courses:** Nil  
(Course Code and Title)

## Part II Course Details

### 1. Abstract

This course introduces algorithms and techniques in artificial intelligence, with particular emphasis on reasoning in constrained and 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 and constrained based reasoning.			✓	
2.	Describe and apply reinforcement learning for real-world problems.			✓	
3.	Perform inferencing 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.)

Teaching pattern:

Suggested lecture/tutorial/laboratory mix: 2 hrs. lecture; 1 hr. tutorial.

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.	✓	✓	✓	✓	
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.	✓	✓	✓	✓	
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, learning 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: <u>50%</u>						
Assignments	✓	✓	✓		30%	Expect to have two assignments with programming elements and/or mathematical proof.
Mid-term test	✓	✓	✓		20%	
Examination: <u>50%</u> (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.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignments	The ability to implement and assess the effectiveness of different algorithms and techniques.	High	Significant	Moderate	Basic	Not even reaching marginal level
2. 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
3. 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

*Reasoning:* constraint satisfaction problems, beam search

*Reinforcement learning:* state-space, passive and active learning

*Knowledge:* first-order logic, inference, planning, knowledge representation

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

*Communication & acting:* natural language processing, robotics

#### 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, <i>Artificial Intelligence: A Modern Approach</i> , 3 <sup>rd</sup> edition, Pearson Education Limited, 2009.
2.	David Poole, Alan Mackworth, <i>Artificial Intelligence: Foundations of Computational Agents</i> , 2 <sup>nd</sup> edition, Cambridge University Press, 2017.

##### 2.2 Additional Readings

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