

CS5491: ARTIFICIAL INTELLIGENCE

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Artificial Intelligence

Subject Code

CS - Computer Science

Course Number

5491

Academic Unit

Computer Science (CS)

College/School

College of Computing (CC)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

CS3334 Data Structures or
CS4335 Design and Analysis of Algorithms, or equivalent

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

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.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 app.)		DEC-A2	DEC-A3
1	Solve problems by searching algorithms.			x	
2	Describe and apply reinforcement learning for real-world problems.			x	
3	Perform inference by knowledge representation and uncertain reasoning.			x	
4	Assess the effectiveness of artificial intelligence for modern applications.		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	Lecture	The lecture will focus on the introduction of main concepts and technologies used in modern AI applications.	1, 2, 3, 4	2 hours/ week
2	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, 2, 3, 4	1 hour/ week

3	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.	1, 2, 3	
4	Midterm	Mid-term test aims to test the basic understanding of AI algorithms in searching and reasoning.	1, 2, 3	
5	Course Project	Students will design and create a system based on a modern AI approach to solve a real-world problem. Students will report their results in a course report.	1, 2, 3, 4	
6	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.	1, 2, 3, 4	

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Assignments	1, 2, 3	20	-	Yes
2	Midterm	1, 2, 3	20	-	No
3	Course Project	1, 2, 3	30	-	Yes

Continuous Assessment (%)

70

Examination (%)

30

Examination Duration (Hours)

2

Minimum Examination Passing Requirement (%)

30

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

Assignments (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

The ability to implement and assess the effectiveness of uncertainty reasoning search algorithms and reinforcement learning algorithms.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal level

Assessment Task

Midterm (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

The ability to understand AI concepts/algorithms and apply them for problem solving.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal level

Assessment Task

Course Project (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Students will design and create a system based on a modern AI approach to solve a real-world problem. Students will report their results in a course report.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal level

Assessment Task

Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

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.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal level

Assessment Task

Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

The ability to implement and assess the effectiveness of uncertainty reasoning search algorithms and reinforcement learning algorithms.

Excellent

(A+, A, A-) Significant

Good

(B+, B) Moderate

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal level

Assessment Task

Midterm (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

The ability to understand AI concepts/algorithms and apply them for problem solving.

Excellent

(A+, A, A-) Significant

Good

(B+, B) Moderate

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Course Project (for students admitted from Semester A 2022/23 to Summer Term 2024)

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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.

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Part III Other Information

Keyword Syllabus

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

Reading List**Compulsory Readings**

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

Additional Readings

Title	
1	Nil