

CS5486: INTELLIGENT SYSTEMS

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Intelligent Systems

Subject Code

CS - Computer Science

Course Number

5486

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

Nil

Precursors

CS2468 Data Structures and Data Management or
CS3334 Data Structures or equivalent

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to equip students with the skills of problem solving using artificial intelligence (AI) techniques through a demonstrable knowledge in a range of problem solving methods and the associated knowledge representation and machine learning techniques.

Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Demonstrate knowledge of the fundamental principles of intelligent systems.	x	x	
2	Distinguish between conventional computer applications and intelligent applications.	x	x	
3	Critique and compare the relative merits of a variety of AI problem solving techniques.	x	x	
4	Formulate and analyse intelligent system problems.	x	x	x
5	Create design and implement intelligent problem solving methods.		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	Lectures and tutorials	The course will consist of a balance-mixed of theory and practice. Through a combination of formal lectures and coursework, the students will become able to apply major AI concepts and problem solving approaches to problem-solving. The coursework will consist of special topics in which the student conducts a case study of a recently proposed AI approach, the findings of which are to be described in a presentation, and a project that involves applying suitable AI algorithms to solve a practical problem.	1, 2, 3, 4, 5	3 hrs/week

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Mini-projects	1, 2, 3, 4, 5	20	
2	Mid-term examination	1, 2, 3, 4	30	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

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**

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

Criterion

Ability to implement some existing AI techniques for problem solving

Excellent

(A+, A, A-) Outstanding

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Below marginal levels

Assessment Task

Mid-term examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to understand and use taught AI techniques for problem solving

Excellent

(A+, A, A-) Outstanding

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Below marginal levels

Assessment Task

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

Criterion

Ability to understand, explain, and apply taught AI techniques for problem solving

Excellent

(A+, A, A-) Outstanding

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Below marginal levels

Assessment Task

Mini-projects (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to implement some existing AI techniques for problem solving

Excellent

(A+, A, A-) Outstanding

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate to basic

Failure

(F) Below marginal levels

Assessment Task

Mid-term examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to understand and use taught AI techniques for problem solving

Excellent

(A+, A, A-) Outstanding

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate to basic

Failure

(F) Below marginal levels

Assessment Task

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

Criterion

Ability to understand, explain, and apply taught AI techniques for problem solving

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Part III Other Information**Keyword Syllabus**

Artificial intelligence vs. computational intelligence. Neural networks. Knowledge representations. Machine learning. Rule-based systems. Fuzzy Systems. Evolutionary computation.

Syllabus;

1. Overview

An introduction to the goals and objectives of AI as a discipline and its milestones. Approaches in AI. Major components in intelligent systems.

2. Knowledge acquisition/representation and machine learning

Methods of knowledge acquisition and representations. Associative memory. Techniques on machine learning such as supervised learning, unsupervised learning, reinforcement learning, and deep learning. Generalization.

3. Nature-inspired optimization methods

Basic concepts of graph and tree search. Optimization methods such as stochastic annealing, neurodynamic optimization, genetic algorithm, particle swarm optimization, ant colony optimization, and differential evolution.

Reading List**Compulsory Readings**

Title	
1	NA

Additional Readings

Title	
1	R. Rojas, Neural Networks: A Systematic Introduction, Springer, 1996.
2	S. Haykin, Neural Networks and Learning Machines (3rd Ed), Prentice-Hall, 2009.
3	S. Russell and P. Norvig Artificial Intelligence: A Modern Approach. 3rd Ed. Prentice-Hall (2009)