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

Excellent
(A+, A, A-) Outstanding

Good
(B+, B) Significant

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

Failure

(F) Below marginal levels

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)