Subject Description Form

Subject Code	COMP 5511
Subject Title	Artificial Intelligence Concepts
Credit Value	3
Level	5
Pre-requisite/Exclusion	Nil
Objectives	This subject aims to introduce the main concepts, ideas and techniques of artificial intelligence (AI) to the students so that they could know the various aspects of AI, understand some essential principles and are able to implement some basic AI techniques in their projects or other related work.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. master the basic searching techniques for problem solving and use them in game playing; b. know how to represent knowledge and use them in inferences and reasoning; c. manage uncertainty and reason in uncertainty situations; d. design and develop knowledge based expert systems; e. use basic machine learning techniques to solve different data analytic problems; f. understand deep learning and artificial neural networks; g. participate in team work, presentation and technical writing.
Subject Synopsis/ Indicative Syllabus	• **Search Strategies and games** Concepts relating to problem space, space graphs, instances, initial and goal states, breath-first, depth-first, bidirectional, uniform cost, heuristic, greedy best first, hill-climbing, local beam search, A* search, games vs search, types of games, Minimax algorithm, αβ-algorithm and pruning, deterministic and non-deterministic games. • **Knowledge Representation, Reasoning and Planning** Predicate logic, first order logic, inference, semantic networks, frames and scripts, multiple inheritance, production rules, inference, forward and backward chaining, conflict resolution. • **Knowledge Based Expert Systems** Knowledge acquisition, expert system shell, expert system architecture, inference engine, explanation facility. • **Uncertainty Management and Reasoning** Bayesian probability, Bayesian network, MYCIN uncertainty factor, Dempster-Shafer Theory of Evidence, Fuzzy logic. • **Learning** Supervised, unsupervised, semi-supervised and reinforcement learning, symbolic and connectionist approaches, decision trees, *k*-means, neurons and artificial neural networks, multi-layer perceptron, CNN and RNN concepts. • **Selected Advanced Topics:** Natural Languages Processing, Computer Vision and Speech Recognition, Robotics.

Teaching/Learning Methodology	This course explores the core AI concepts. It provides a comprehensive introduction to the problems and techniques of artificial intelligence. Theory and practice are both emphasized. To enhance the understanding of how conceptions and ideas in AI are actually implemented, prolog and expert system shells will be used for programming exercises and projects. Lectures will be supplemented with video sessions to enhance student's learning. A fair portion of guided reading will also be provided. 39 hours of class activities including - lecture, tutorial, lab, workshop seminar where applicable.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific Assessment Methods/Tasks	% weighting	Intended subject learning outcomes to be assessed						
		a	b	c	d	e	f	g
Assignments, Tests & Projects	55	✓	✓	✓	✓	✓	✓	✓
Final Examination	45	✓	✓	✓	✓	✓	✓	
Total	100							

Student study effort expected	**Class Contact:**	
	Class activities (lecture, tutorial, lab)	39 hours
	Other student study effort:	
	Assignments, Quizzes, Projects, Exams	65 hours
	Total student study effort	**104 hours**

Reading list and references	(1). Bratko, I., 2001, PROLOG, Programming for Artificial Intelligence, 3rd edition, Addison-Wesley. (2). Luger, G.F., 2009, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 6th edition, Addison-Wesley. (3). Russell, S. and Norvig, P., 2003, Artificial Intelligence - A Modern Approach, 2nd edition, Prentice Hall. *Papers and articles selected from:* Artificial Intelligence AI Expert AI Magazine Applied Intelligence IEEE Computer IEEE Intelligent Systems and their Applications IEEE Trans. Neural Networks