Subject Description Form

Subject Code	COMP 5511
Subject Title	Artificial Intelligence Concepts
Credit Value	3
Level	5
Pre-requisite/Exclusion	Nil
Objectives	The objectives of this subject are to: 1. introduce the main concepts, ideas and techniques of artificial intelligence (AI); 2. facilitate the implementation of some basic AI techniques.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. master the important 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. critically review and consolidate existing knowledge to design and develop knowledge based expert systems; e. use basic machine learning techniques to solve different data analytic problems; f. able to incorporate advanced deep learning and artificial neural networks techniques;
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.

<table>
<tr><td>Teaching/Learning Methodology</td><td>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.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific Assessment Methods/Tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td></tr>
<tr><td>Assignments, Tests & Projects</td><td>55</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Final Examination</td><td>45</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100</td><td colspan="6"></td></tr>
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<tr><td rowspan="5">Student study effort expected</td><td colspan="2">Class Contact:</td></tr>
<tr><td>Class activities (lecture, tutorial, lab)</td><td>39 hours</td></tr>
<tr><td colspan="2">Other student study effort:</td></tr>
<tr><td>Assignments, Quizzes, Projects, Exams</td><td>66 hours</td></tr>
<tr><td>Total student study effort</td><td>105 hours</td></tr>
<tr><td>Reading list and references</td><td>(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</td></tr>
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