Course Code	PCS21E01J	Course Name	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	Course Category	D	Discipline Elective Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,
CLR-1 :	*Gain knowledge about Artificial Intelligence(AI) and Heuristic search technique*
CLR-2 :	*Gain knowledge about Knowledge representations and Predicate logic*
CLR-3 :	*Understand Machine Learning and concept learning, Develop a Learning System*
CLR-4 :	*Understand and Apply real time problem using Artificial Intelligence*
CLR-5 :	*Practice the Machine Learning Models*
CLR-6	*Understand the Decision tree and , Neural Network and Genetic algorithm*

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	PSO 1	PSO 2	PSO 3
CLO-1 :	*Have an understanding of AI and its challenges*	3	80	70	L	H	-	H	L	-	-								-
CLO-2 :	*Apply predicate logic for problem solving*	3	85	75	M	H	L	M	L	-	-								-
CLO-3 :	*Understand the various learning methods and their applications*	3	75	70	M	H	M	H	L	-	-								-
CLO-4 :	*Have a thorough understanding of various ML algorithms*	3	85	80	M	H	M	H	L	-	-								-
CLO-5 :	*Clear understanding of the fundamentals of Neural Networks*	3	85	75	H	H	M	H	L	-	-								-
CLO-6	*Apply ML for solving real-life problems*	3	85	80	L	H	H	H	H	-	-								-

Duration(Hour)		15	15	15	15	15
S-1	SLO-1	*Introduction to AI*	*Problem-Solving Agents*	*Hill-climbing search*	*Learning and Forms of Learning*	*Expert systems:- Introduction*
	SLO-2	*Goal and Philosophy of AI*	*Toy Problem*	*Simulated annealing search*	*Inductive Learning*	*Basic concepts in Expert System*
S-2	SLO-1	*Sub areas of AI,applications*	*Some real world problems*	*Local Beam Search*	*Learning Decision Trees*	*Structure of expert systems.*
	SLO-2	*AI Techniques*	*Searching for Solutions*	*Genetic Algorithms*	*Ensemble Learning*	*The human element in expert systems how expert systems works,*
S-3	SLO-1	*Applications of AI*	*Breadth-first search*	*Knowledge Based Agents*	*Computational Learning Theory*	*Problem areas addressed by expert systems*
	SLO-2	*History of AI*	*Depth-first search*	*Propositional Logic Introduction*	*Examples and Hypothesis in Learning*	*expert systems success factors*
S-4 to S-5	SLO-1	*Lab 1 : AI Techniques implementation*	*Lab : 4 Knowledge implementation*	*Lab : 7 Concept Learning task*	*Lab : 10 Decision tree implementation*	*Lab : 13 Neural Network model implementation*
S-6	SLO-1	*Types of Intelligence*	*Depth-limited search*	*Propositional Logic Semantics*	*Knowledge in Learning*	*Types of expert systems*
	SLO-2	*Inductive and Deductive Reasoning*	*Iterative deepening depth-first search*	*Reasoning Patterns in Propositional Logic*	*Explanation based learning*	*Expert systems and the web*
S-7	SLO-1	*Human Vs Machine Intelligence*	*Bidirectional search*	*Forward and Backward Chaining*	*Learning used Relevant Information*	*Knowledge engineering and scope of knowledge*
	SLO-2	*Agents and Environments*	*Comparing uninformed search strategies*	*Agents Based on Proportional Logic*	*Inductive Logic Programming*	*Difficulties, in knowledge acquisition methods of knowledge acquisition*
S-8	SLO-1	*Concept of Rationality*	*Avoiding Repeated States*	*First-Order Logic Intro*	*Learning with Hidden Variables*	*Machine learning, and intelligent agents,*

Duration(Hour)		15	15	15	15	15
	SLO-2	*Structure of Agents*	*Searching with Partial Information*	*Models for first-order logic*	*The EM Algorithm*	*Selecting an appropriate knowledge acquisition method*
S-9 to S-10	SLO-1	*Problem solving Agents*	*Lab : 5 Implementations of FOPL and Rules*	*Lab : 8 Design a Learning System*	*Lab : 11 Implementation of Decision tree and K- Mean algorithm*	*Lab : 14 Implementation of Multi-layer neural network*
S-11	SLO-1	*The Nature of Environments*	*Informed (Heuristic) Search Strategies*	*Symbols and interpretations for first-order logic*	*Instance Based Learning*	*Societal impacts reasoning in artificial intelligence,*
	SLO-2	*Agent Programs*	*Greedy best-first search*	*Terms for first-order logic*	*Introduction to Neural Networks*	*Inference with rules, with frames*
S-12	SLO-1	*Simple reflex agents*	*A* search*	*Atomic sentences in First Order Logic*	*Single layer feed-forward neural networks*	*Model based reasoning,*
	SLO-2	*Model-based reflex agents*	*Memory-bounded heuristic search*	*Assertions and queries in first-order logic*	*Multi layered feed-forward neural networks*	*Case based reasoning,*
S-13	SLO-1	*Goal-based agents*	*The effect of heuristic accuracy on performance*	*Knowledge Engineering in First-Order Logic*	*Reinforcement Learning*	*Explanation & meta knowledge*
	SLO-2	*Utility-based agents*	*Inventing admissible heuristic functions*	*Propositional vs. First-Order Inference*	*Passive and Active Reinforcement Learning*	*Meta knowledge inference with uncertainty representing uncertainty*
S-14 to S-15	SLO-1	*Lab 3 : Implementation of intelligent agents*	*Lab : 6 Implementation of Ontology and FOL*	*Lab : 9 Implementation of candidate elimination algorithm*	*Lab : 12 Implementation of ID3 algorithm*	*Lab : 15 Applying Backpropagation and genetic algorithm*

Learning Resources	1. Rich Elaine & Kevin Knight – Artificial Intelligence – Tata McGraw Hill -1993 2. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997. (Chapters : 1, 2, 3, 4, 8 and 9)	3. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Datall, First Edition, Cambridge University Press, 2012. 4. Stephen Marsland, —Machine Learning –An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

Learning Assessment

Bloom's Level of Thinking		Continous Learning Assessment(50% Weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4# (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr. S. Karthik, Assistant Consultant, Tata Consultancy Services	Dr. S. Sasikala, Associate Professor and Head, Dept. of Computer Science, University of Madras	Dr. Sweety Bakyarani. E
		Dr. Sabeen