

Artificial Intelligence and Machine Learning (Integrated)

Course Code	21CS63	Course type	IPCC	Credits L-T-P	3 - 0 - 1
Hours/week: L - T- P	3 - 0 - 2			Total credits	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Course learning objectives	
1.	To understand various artificial intelligence techniques
2.	To understand different logical systems for inference over formal domain representations
3.	To understand basic concepts of machine learning
4.	To apply artificial intelligence and machine learning techniques to real world problems

Required Knowledge of: Algorithm, Probability, Discrete Mathematical Structures
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Unit – I	Contact Hours = 8 Hours
Introduction to Artificial Intelligence: Introduction, what is AI, Strong Methods, and Weak Methods, Uses and Limitations Knowledge Representation: Need for good representation, Semantic nets, Frames, Search Spaces, Semantics Tress, Search Trees, Combinatorial Explosion, Problem reduction, Goal Trees	

Unit – II	Contact Hours = 8 Hours
Search Methodologies: Introduction, Problem solving as search, Data driven or goal driven search, Generate and test, Properties of search methods, Depth First Iterative Deepening, Using Heuristics for Search, Hill Climbing, Best-First Search, Identifying Optimal Paths, Constraint Satisfaction Search, Forward Checking, Ant Colony Optimization, Genetic Algorithms for search, Bidirectional search, Non-chronological backtracking	

Unit – III	Contact Hours = 8 Hours
Game Playing: Game trees, Minimax, Alpha beta pruning Introduction to Machine Learning-I: Introduction, Training Rote Learning, Learning Concepts, General-to-Specific Ordering, Version Spaces, Candidate Elimination, Decision-Tree Induction, The Problem of Overfitting, Reinforcement Learning	

Unit – IV	Contact Hours = 8 Hours
Introduction to Machine Learning-II: The Nearest Neighbor-K nearest neighbor algorithm, Linear regression, Support vector machine, k-means clustering Neural Networks: Introduction, Neurons, Perceptrons, Multilayer Neural Networks- Backpropagation algorithms, Recurrent Networks, Unsupervised Learning Networks	

Unit – V	Contact Hours = 8 Hours
Probabilistic Reasoning and Bayesian Belief Networks: Introduction, Probabilistic Reasoning, Joint Probability Distributions, Bayes’ Theorem, Simple Bayesian Concept Learning, Bayesian Belief Networks, The Noisy-V Function, Bayes’ Optimal Classifier, The Naïve Bayes Classifier	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	2	3	3	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
2.	3	DFID algorithm
		Heuristic search algorithm
		A* algorithm
3.	2	Game trees
		Find-S algorithm
4.	4	Single Layer Perceptrons
		Backpropagation
		Unsupervised learning networks
		Clustering algorithm
5.	1	Naïve Bayes Algorithm

Unit No.	Self-Study Topics
1.	Inheritance, Object oriented programming
2.	Depth First Search, Breadth First Search, Implementing Depth-First and Breadth-First Search, Beam Search
3.	Truth Tables: Not, And, Or, Implies, if, Complex Truth Tables, Tautology, Equivalence, The Deduction Theorem
4.	Supervised Learning, Unsupervised Learning, Hebbian Learning, Linear Regression
5.	Collaborative Filtering

Books	
	Text Books:
1.	Ben Coppin, Artificial Intelligence Illuminated, Jones and Bartlett, 2004
2.	Tom M. Mitchell, “Machine Learning”, Mcgraw-Hill Education (Indian Edition), 2013
	Reference Books:
1.	Elaine Rich Kevin Knight, Shivashankar B Nair: Artificial Intelligence, Tata McGraw Hill 3 rd edition 2013.

2.	Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3 rd edition 2013.
3.	Ethem Alpaydin, "Introduction to Machine Learning", 2 nd Edition, PHI Learning Pvt. Ltd., 2013.
E-resources (NPTEL/SWAYAM.. Any Other)- mention links	
1.	https://nptel.ac.in/courses/106105077
2.	https://nptel.ac.in/courses/106106139

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination

Course Outcome (COs)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	Apply difficult real-world problems in a state space representation to solve them using AI techniques	Ap	1,2,3,5,12	1,2,3
2.	Understand the informed and uninformed problem types and apply search strategies to solve them.	Ap	1,2,3,5,12	1,2,3
3.	Understand the basics of machine learning and neural networks to solve real world problems	An	1,2,3,5,12	1,2,3
4.	Understand the concepts in Bayesian analysis from probability models and methods	Re	1,2,3,5,12	1,2,3
5.	Apply the learnings inculcated throughout the course and develop a course project / present a seminar on that	An	1,2,3,5,9,10,11,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY**) will be part of the CIE. **No SEE for Lab.**

THEORY (60 marks)			LAB (40 marks)		Total
IA test 1	IA test 2	Assignment (OBA/Lab Project/ Industry assignment)/ Course project	Conduction	Lab test	
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks
IA Test: 1. No objective part in IA question paper 2. All questions descriptive					
Conduct of Lab: 1. Conducting the experiment and journal: 5 marks					

2. Calculations, results, graph, conclusion and Outcome: 5 marks
3. Viva voce: 5 marks
Lab test: (Batchwise with 15 students/batch)
1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 10 marks
5. Viva voce: 10 marks
Eligibility for SEE:
1. 40% and above (24 marks and above) in theory component
2. 40% and above (16 marks and above) in lab component
3. Lab test is COMPULSORY
4. Not eligible in any one of the two components will make the student Not Eligible for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours' duration.
2.	Minimum marks required in SEE to pass: Score should be ≥ 35 &, however overall score of CIE+SEE should be $\geq 40\%$.
3.	Question paper contains three parts A, B and C . Students have to answer <ol style="list-style-type: none"> From Part A answer any 5 questions each Question Carries 6 Marks. From Part B answer any one full question from each unit and each Question Carries 10 Marks. From Part C answer any one full question and each Question Carries 20 Marks.

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	✓	✓	✓		✓							✓	✓	✓	✓
2	✓	✓	✓		✓							✓	✓	✓	✓
3	✓	✓	✓		✓							✓	✓	✓	✓
4	✓	✓	✓		✓							✓	✓	✓	✓
5	✓	✓	✓		✓				✓	✓	✓	✓	✓	✓	✓

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Data modeling and evaluation	Healthcare Sector	Data Scientist
2	Proficiency in conceptual knowledge of neural networks	e-commerce	Machine Learning Engineer
3	Build classifiers	Banking and finance	Business Intelligence Developer