Course Code: IT-34
Course Name: Knowledge Representation and Artificial Intelligence: ML, DL

Credit Scheme			Evaluation Scheme				
Lecture	**Practical**	**Credit**	**Internal**			External	Total
			Written	Practical	Tutorial		
3 Hrs./Week	-	3	25	--	--	50	75

Course Description:

Course Objectives:

Course Outcomes:

Student will be able to

    CO1: Understand basic building block of Artificial Intelligence and Knowledge Representation.
    (Understand)
    CO2: Apply Propositional Logic for knowledge representation. (Apply)
    CO3: Design various models based on Machine Learning methodology (Apply)
    CO4: Design various models based on Deep Learning methodology (Apply)
    CO5: Understand various hardware and software aspect used for AI and its application.
    (Understand)

Course Structure:

Unit No.	Topics Details	Weightage in %	No of Sessions

1	1. Artificial Intelligence and Knowledge representation
	   1.1. Introduction to Artificial Intelligence and its evolution.
	   1.2. What is Intelligence and Artificial Intelligence
	   1.3. How AI is affecting on real life?
	   1.4. Different branches of AI
	   1.5. Limitations of AI
	   1.6. Need of knowledge Representation
	   1.7. Knowledge Representation and Mapping schemes
	   1.8. Properties of good knowledge-based system
	   1.9. Types of knowledge
	   1.10. Knowledge Representation issues
	   1.11. AND-OR Graph
	   1.12. The Wumpus World
		15	3

2	2. Propositional Logic	15	8
	2.1. Mathematical Logic and Inference		
	2.2. First Order Logic: Syntax and Semantic, Inference in FOL		
	2.3. Forward chaining, backward Chaining		
	2.4. Language		
	2.5. Semantics and Reasoning		
	2.6. Syntax and Truth Values,		
	2.7. Valid Arguments and Proof Systems		
	2.8. Rules of Inference and Natural Deduction		
	2.9. Axiomatic Systems and Hilbert Style Proofs		
	2.10. The Tableau Method		
	2.11. The Resolution Refutation Method		
	Problems based on FOPL		
3	3. Machine Learning	30	15
	3.1. History of Machine Learning		
	3.2. Machine Learning Vs Statistical Learning		
	3.3. 3Type of Machine Learning - Supervised, Unsupervised Learning, Reinforcement Learning		
	3.3.1. Linear Regression		
	3.3.2. Logistic Regression		
	3.3.3. Support Vector Machines		
	3.3.4. Random Forest		
	3.3.5. Naïve Bayes Classification		
	3.3.6. Ordinary Least Square Regression		
	3.3.7. K-means		
	3.4. Essentials of Data and its analysis		
	3.5. Framework of Data Analysis		
	Extra Reading: Forms of Learning, Inductive Learning, Ensemble Methods, Apriori Algorithm, Principal Component Analysis, Singular Value Decomposition, Reinforcement or Semi-Supervised Machine Learning, Independent Component Analysis		
4	4. Deep Learning	30	15
	4.1. Fundamentals of Deep networks and Defining Deep learning		
	4.2. Deep learning Problem types		
	4.2.1. ANN		
	4.2.2. CNN		
	4.2.3. RNN		
	4.2.4. GAN		
	4.2.5. NLP		
	4.3. Building blocks of Deep learning		
	4.4. Classification and Detection		

	Algorithms should be taught using Python Library – Pytorch **Extra Reading:** DNN, Transfer Learning, Architectural Principals of Deep networks – AlexNet, VGG 16, Inception, MobileNet			

5	5. Hardware and Software for AI
	    5.1. Data Center
	    5.2. Gateway edge computing
	    5.3. Keyprocessor for AI
	    5.4. CPU and GPU
	    5.5. Field Programmable Gate Array (FPGA)
		5	2

6	6. Application of AI
	    6.1. Robotics Process Automation – Chatbot
	    6.2. NLP
	    6.3. Image Processing
	    6.4. Speech Recognition
		5	2

	Total:	**100**	**45**

Course References:

Recommended Books:

Reference Books:

1. Artificial Intelligence, 3rd Edition, Elaine Rich, Kevin Knight, S.B. Nair - Tata McGraw Hill.
2. Artificial Intelligence: A Modern Approach Textbook by Peter Norvig and Stuart J. Russell
3. Artificial Intelligence by Patrick Henry Winston - Addison-Wesley, Third Edition.
4. Artificial Intelligence and Intelligent Systems by N.P.Padhy - Oxford University Press.
5. Data Mining practical Machine Learning Tools and Techniques by Ian H. Witten Eibe Frank Mark Hall - Elsevier publication
6. Python Machine Learning and Deep Learning with Python Scikit-learn, and TensorFlow 2, 3rd Edition by Sebastian Raschka, Vahid Mirjalil
7. Machine Learning by Tom M Mitchell – TMGH Publication
8. Machine Learning using Python by Manaranjan Pradhan and U. Dinesh Kumar – WILEY Publication
9. Machine Learning for Big Data – Hands on for Developers and Technical Professionals by Jason Bell – WILEY Publication