COURSE CODE	COURSE TITLE	L	T	P	C
1152CS172	DEEP LEARNING	3	0	0	3

Course Category: Program Elective

A. Preamble:

This course provides an introduction to the basics of machine learning, neural networks, and Deep learning techniques. This course also provides the learning practice and acquires knowledge on deep learning tools.

B. Pre-requisites:

Sl No	Course Code	Course Name
1	1151CS101	Concrete Mathematics

C. Related Courses:

Sl No	Course Code	Course Name
1	1156CS601	Minor Project
2	1156CS701	Major Project

D. Course Outcomes:

Students undergoing this course are able to:

CO Nos	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Discuss the concepts of machine learning algorithms.	K2
CO2	Understand the fundamentals of neural networks.	K2
CO3	Explain the different Strategies and Perspectives of Deep learning fundamentals.	K2
CO4	Illustrate the concepts of CNN and RNN models.	K2
CO5	Apply the knowledge in deep learning tools.	K3

E. Correlation of COs with POs:

Cos	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
CO1	**M**	**L**						**L**					**M**		**L**
CO2	**M**	**L**	**L**					**M**			**H**		**M**		**L**
CO3	**M**	**L**						**M**			**L**		**M**		**L**
CO4	**M**	**L**	**L**	**L**	**M**			**M**	**M**		**L**		**M**	**M**	**L**
CO5	**L**	**L**	**L**		**H**			**H**	**M**		**H**	**L**	**L**	**M**	**M**

H- High; M-Medium; L-Low

F. Course content:

UNIT I MACHINE LEARNING **9**

Machine Learning - Examples of machine learning applications - Types of machine learning –

Supervised Learning: Classification - Decision Trees, Neural Networks – Unsupervised Learning**:** Clustering- Clustering Methods-Graph Clustering.

UNIT II FUNDAMENTALS OF NEURAL NETWORKS **9**

Basics of Neural Networks- Neural network representation-History and cognitive basis of neural computation- Perceptrons- Perceptron Learning Algorithm- Multilayer Perceptrons (MLPs)- Representation Power of MLPs- Back Propagation.

UNIT III DEEP LEARNING FUNDAMENTALS AND STRATEGIES **9**

Introduction to deep learning-History of Deep Learning- Perspectives and issues in deep learning – Deep Neural Networks - Unsupervised deep learning - Deep reinforcement learning - Deep learning strategies.

UNIT IV CNN and RNN **9**

Foundations on CNN, Convolutional Neural Networks (CNNs): LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet- -Recurrent Neural Networks-Optimization in deep learning: Gradient Descent (GD) - Momentum Based GD.

UNIT V DEEP LEARNING TOOLS **9**

CUDA ToolKit **:** Introduction, Programming Model, Programming interface, Performance Guidelines- NVIDIA- NVIDIA Architecture- Case Study **: Tensor Flow,** Caffe, Theano, Torch.

TOTAL: 45

G. Learning Resources

i. Text Books

1. Goodfellow, I., Bengio,Y., and Courville, A., "Deep Learning", MIT Press, 2016..
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2014.
3. Li Deng and Ding Yu, "Deep Learning Methods and Applications", Now Publishers, 2014.

ii. Reference Books

1. Tom M Mitchell, "Machine Learning" , First Edition, McGraw Hill Education, 2013
2. Yegnanarayana, B , "Artificial Neural Networks", PHI Learning Pvt. Ltd, 2009.
3. Satish Kumar, "Neural Networks: A Classroom Approach", Tata McGraw-Hill Education, 2004.
4. Christopher Bishop, "Pattern Recognition and Machine Learning" 2e,Springer, 2006.

iii. Digital Resources

1. http://www.deeplearningbook.org
2. https://nptel.ac.in/courses/117105084/
3. https://en.wikipedia.org/wiki/Deep_learning
   https://en.wikipedia.org/wiki/Neural_network