

Course Code	Course Title	L	T	P	C
1152EC152	ANN AND DEEP LEARNING	3	0	0	3

**a) Course Category**

Program Elective

**b) Preamble**

This course covers the fundamentals from Artificial Neural Network to the current trending topic of Convolution Neural Network. Deep Learning is one of the most exciting and promising segments of Artificial Intelligence and machine learning technologies. However, with the increased availability of vast amounts of data and computational capability, it has evolved to a field of its own. In the last few years with numerous applications in computer vision, speech analysis, healthcare, agriculture, and understanding climate change etc. Thus this course aims to provide basic knowledge about the deep learning.

**c) Prerequisite**

Signals and systems

**d) Course Objectives**

1. To introduce the fundamental techniques and principles of Neural Networks
2. To study the different models in ANN and their applications
3. To familiarize deep learning concepts with Convolutional Neural Network case studies

**e) Related Courses**

Digital Image Processing, speech processing

**f) Course Outcomes**

On successful completion of the course, the students will be able to

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Explain the basic concepts in Neural Networks and applications	K2
CO2	Discuss feed forward networks and their training issues	K2
CO3	Distinguish different types of ANN architectures	K2
CO4	Explain the deep learning concepts using Back Propagation Network	K2
CO5	Discuss Convolutional Neural Network models to Object	K2

	Detection and image Retrieval	
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g)	Correlation of COs with POs													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

**h) Course Content**

**UNIT I INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 9**

Fundamentals Of Neural Networks – Model of Artificial Neuron – Neural Network Architectures – Learning Methods – Taxonomy Of Neural Network Architectures – Applications

**UNIT II FEED FORWARD NEURAL NETWORKS 9**

Perceptron Models: Discrete, Continuous and Multi-Category –Training Algorithms: Discrete and Continuous Perceptron Networks – Limitations of the Perceptron – Model. Credit Assignment Problem – Generalized Delta Rule, Derivation of Back propagation (BP) Training, and Summary of Back propagation Algorithm –Kolmogorov Theorem

**UNIT III OTHER ANN ARCHITECTURES 9**

Associative Memory – Exponential BAM – Associative Memory For Real Coded Pattern Pairs – Applications Adaptive Resonance Theory – Introduction – ART 1 – ART2 – Applications – Neural Networks Based On Competition – Kohonen Self Organizing Maps – Learning Vector Quantization – Counter Propagation Networks – Industrial Applications

**UNIT IV DEEP LEARNING 9**

Deep Feed Forward network, regularizations, training deep models, dropouts, Training Deep Neural Networks using Back Propagation-Setup and initialization issues, vanishing and exploding Gradient problems, Gradient- Descent Strategies

**UNIT V CONVOLUTIONAL NEURAL NETWORK 9**

Convolutional Neural Network, Basic structure of Convolutional Network, Case studies: Alex net, VGG-Net, GoogleNet, Applications of CNN– Object Detection, Content based image Retrieval.

**Total 45 Hrs**

## **i) Learning Resources**

### **Text Books**

1. CharuC.Aggarwal "Neural Networks and Deep learning" Springer International Publishing, 2018
2. Satish Kumar, "Neural Networks, A Classroom Approach", Tata McGraw -Hill, 2007.
3. Simon Haykin, "Neural Networks, A Comprehensive Foundation", 2nd Edition, Addison Wesley Longman, 2001.

### **Reference Books**

1. Bishop, Christopher M. Pattern Recognition and Machine Learning. Springer, 2006
2. Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000.

### **Online Resources**

1. Michael Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015.  
<http://neuralnetworksanddeeplearning.com/>