

<b>COURSE TITLE</b>	<b>DEEP LEARNING</b>
<b>COURSE CODE</b>	<b>01AI0701</b>
<b>COURSE CREDITS</b>	<b>4</b>

**Objective:**

- 1 Student will understand Deep learning Techniques and their principles. The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of neural networks, Convolutional neural network and its applications, Neural language processing RNN, LSTM, GRU, DBM- Image Segmentation.
- 2 Student will understand Deep learning Techniques and their principles.
- 3 The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of neural networks, Convolutional neural network and its applications, neural language processing RNN, LSTM, GRU, DBM- Image Segmentation.
- 4 Student will understand Deep learning Techniques and their principles. The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of neural networks, Convolutional neural network and its applications, neural language processing RNN, LSTM, GRU, DBM- Image Segmentation.

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Understand the role of deep learning in machine learning applications and get familiar with the use of TensorFlow/Keras in deep learning applications (Understanding)
- 2 Compare Various deep learning Algorithms used for Classification Segmentation and detection. (Evaluate)
- 3 Apply various concepts related with Deep Learning to solve Problems. (Apply)
- 4 Analyse different deep learning models in Image related projects. (Analyse)

**Pre-requisite of course:**Machine Learning Techniques.

**Teaching and Examination Scheme**

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	<b>Introduction to Deep Learning</b> Introduction to deep learning and biological motivation, Applications of deep learning, suitable problems for deep learning, Neurons, Neural Network, Activation Function	5

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
2	<b>Neural Networks</b> Single layer neural network, Stochastic Gradient Descent, Gradient Descent Extensions, Gradient Descent Regularization, Multilayer Perceptron, Back propagation, Chain Rule, Deep Learning Model	9
3	<b>Convolutional Neural Network</b> Introduction with Background and Application, properties of CNN Motivation for Convolutional Layer, CNN Architecture, Training for Deep CNN, Padding and Stride, Computer vision tasks	8
4	<b>Unsupervised Representational Learning</b> Introduction with Motivation and Application, Auto encoder, Neural Language Processing, Word embeddings, Generative models, Generative Adversarial Networks	9
5	<b>RNN,LSTM and GRU</b> RNN, LSTM, GRU- Image Segmentation, Image classification,, Object Detection, Automatic Image Captioning, ,Image generation with Generative Adversarial Networks, LSTM as a classifier Model, Attention Models for Computer Vision	9
6	<b>Applications and Case Study</b> Case Study: Named Entity Recognition, Opinion Mining using Recurrent Neural Networks, Parsing and Sentiment Analysis using Recursive Neural Networks, Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs	5
<b>Total Hours</b>		<b>45</b>

#### **Suggested List of Experiments:**

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Experiments</b> Implement Simple Programs like vector addition in TensorFlow, Implement a simple problem like regression model in Keras, Implement a perceptron in TensorFlow/Keras Environment., Implement a Feed-Forward Network in TensorFlow/Keras, Implement an Image Classifier using CNN in TensorFlow/Keras., Implement a Transfer Learning concept in Image Classification, Implement an Autoencoder in TensorFlow/Keras, Implement a Simple LSTM using TensorFlow/Keras, Implement an Opinion Mining in Recurrent Neural network, Implement an Object Detection using CNN	20
<b>Total Hours</b>		<b>20</b>

#### **Textbook :**

- 1 Deep learning, Heaton, J. Ian goodfellow, yoshua bengio, and aaron courville, The MIT Press, -

**References:**

- 1 Deep learning - Heaton, J. Ian goodfellow, yoshua bengio, and aaron courville, The MIT Press, First Edition
- 2 Deep learning with Python- Chollet, Francois, New York: Manning Publications, First Edition
- 3 Convolutional Neural Networks in Visual Computing - Ragav Venkatesan, Baoxin Li, CRC Press, First Edition
- 4 Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence - Phil Kim, APress, Third Edition
- 5 Deep Learning with Applications Using Python, Navin Kumar Manaswi, Apress, First Edition
- 6 R Deep Learning Essentials, Joshua F. Wiley, ackt Publications, First Edition

**Suggested Theory Distribution:**

The suggested theory distribution as per Bloom’s taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
20.00	25.00	25.00	15.00	15.00	0.00

**Instructional Method:**

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

**Supplementary Resources:**

- 1 [www.nptel.ac.in/courses/106/106/106106184/](http://www.nptel.ac.in/courses/106/106/106106184/)
- 2 [www.nptel.ac.in/courses/106/106/106106201/](http://www.nptel.ac.in/courses/106/106/106106201/)
- 3 [www.nptel.ac.in/courses/106/105/106105215/](http://www.nptel.ac.in/courses/106/105/106105215/)
- 4 [www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s191-introductionto-deep-learning-january-iap-2020/](http://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s191-introductionto-deep-learning-january-iap-2020/) 5.
- 5 [www.kaggle.com/learn/intro-to-deep-learning](http://www.kaggle.com/learn/intro-to-deep-learning)