NIRMA UNIVERSITY
Institute of Technology
B. Tech. Computer Science and Engineering
Semester – VI
Department Elective-II

L	T	P	C
3	0	2	4

Course Code	2CSDE61
Course Title	Deep Learning

Course Outcomes:

At the end of the course, students will be able to -

1. appraise the need of deep learning approaches over machine learning
2. identify the deep learning algorithms which are appropriate for different types of learning tasks in various domains
3. implement deep learning algorithms and solve real-world problems
4. analyze and evaluate various deep learning models.

Syllabus:

Teaching Hours: 45

Unit I — **06**

Review of Artificial Neural Networks: Perceptron Learning, Feed Forward Neural Networks, Back-propagation, Unstable Gradient Problem, Limitations of Feed Forward Neural Networks for Computer Vision Problems

Unit II — **08**

Convolutional Neural Networks: Convolution & Pooling, Dropout, Batch Normalization, State-of-the-art CNNs

Unit III — **05**

Transfer Learning & Domain Adaptation: Transfer Learning Scenarios, Applications of Transfer Learning, Transfer Learning Methods, Fine Tuning and Data Augmentation, Supervised, Semi Supervised and Unsupervised Deep Learning

Unit IV — **08**

Convolutional Neural Networks for Computer Vision : Image Classification, Image Classification with Localization, Semantic Segmentation, Object Detection

Unit V — **09**

Sequence Models: Recurrent Neural Networks (RNN), Language Modelling, Long-Short Term Memory Network, Gated Recurrent Unit, Bi-directional RNN, Deep RNN, Applications of Sequence Models

Unit VI — **09**

Miscellaneous: Auto encoders and Stacked Auto encoders, Generative Adversarial Networks, Deep Reinforcement Learning

Self-Study:
To be decided by the course coordinator at the beginning of semester, which will be a blend of one or more of the e-Learning Resources, Video Lectures, Online courses, tools, research material, web links etc. along with the related assessment component(s).

Laboratory Work:

Above concepts are to be implemented using a deep learning programming framework through either project work or around 5 experiments.

Suggested Readings^:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press
2. Charu C. Aggarwal, Neural Networks and Deep Learning – A Textbook, Springer
3. Adam Gibson, Josh Patterson, Deep Learning, O'Reilly Media, Inc.
4. Duda, R.O., Hart, P.E., and Stork, D.G., Pattern Classification, Wiley.
5. Theodoridis, S. and Koutroumbas, K., Pattern Recognition. Academic Press
6. Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence
7. Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press.
8. Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning, Springer
9. Koller, D. and Friedman, N. Probabilistic Graphical Models. MIT Press
10. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer

L=Lecture, T=Tutorial, P=Practical, C=Credit

^this is not an exhaustive list