# Guru Tegh Bahadur Institute of Technology, New Delhi

**Lecture Plan for Fundamentals of Deep Learning**

# Course Name: B.Tech (AIML) Semester: 5th SUB CODE: AIML 305

No of hours allotted to complete the syllabi: **40**

No of hours allotted per week: **4**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Topic Details** | **No of Hours Planned** | **Reference/text book** |
| 1. | **Unit-I:** |  |  |
|  | Introduction to Deep Learning, Bayesian Learning, Overview of Shallow Machine Learning, Differences between Deep Learning and Shallow Learning,  Linear Classifiers  Loss Function and Optimization Techniques- Gradient Descent and batch optimization | 4  2    4 | T1, R1  T1, R1  T2, R1 |
|  |  |  |  |
| 2. | **Unit-II**  Introduction to Neural Networks, Biological Neuron, Idea of Computational units  McCulloch-Pitts unit and Thresholding logic  Artificial Neural Networks: Single Layer Neural Network  Multilayer Perceptron and Backpropagation  Back propagation through time  Architectural Design Issues | 2  2  1  2  2  1 | T2, R1  T2, R1  T3, R2  T3, R1, R2  T3, R1, R2  T3, R1, R2 |
| 3. | **Unit-III**  Training deep neural networks: Difficulty of training deep neural networks  Activation Functions  Evaluating, Improving and Tuning the ANN  Hyper parameters vs Parameters  Greedy layer wise training  Recurrent Neural Networks, LSTM, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs | 1  2  1  1  1  4 | T2, R1  T2, R1  T2, R1  T1, R2  T2, R1  T2, R1, R2 |
| 4. | **Unit-IV**  Con**v**olution Neural Networks, Building blocks of CNN, Pooling Layers, Convolution Neural Network Architecture  Transfer Learning  Well Known Case Studies: LeNet, AlexNet, VGG-16, ResNet, InceptionNet  Application of CNN in vision, Speech and Audio-Video. | 3  1  4  2 | T3, R1, R2  T3, R1, R2  T2, R1, R2  T3, R1, R2 |

## Text Books:

[T1] Richard O.Duda, “Pattern Classification”, Wiley,2022

[T2] Adam Gibson and Josh Patterson,” Deep Learning: A Practical approach”, 2017

[T3] Deep Learning, lan Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016

## Reference Books:

[R1] Charu C. Aggarwal, “Neural Networks and Deep Learning”, 2018

[R2] Duda , R.O. and Hart, P.E., Pattern Classification. John Wiley & Sons,2006.