NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	Integrated B.Tech.(CSE)-MBA
Course Code:	CSI0907
Course Title:	Deep Learning
Course Type:	(□ Core/ □ Value Added Course / **√ Department Elective** / □ Institute Elective/ □ University Elective/ □ Open Elective / □ Any other)
Year of Introduction:	2022-23

L	T	Practical Component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to –

1. identify the deep learning algorithms which are appropriate for different types of learning tasks in various domains (BL3)
2. examine different deep learning algorithms to solve real-world problems (BL4)
3. appraise the need of deep learning approaches over machine learning (BL5)
4. design various deep learning models (BL6)

Syllabus: **Total Teaching hours: 30**

Unit	Syllabus	Teaching hours
Unit-I	**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	06
Unit-II	**Convolutional Neural Networks:** Convolution & Pooling, Dropout, Batch Normalization, State-of-the-art CNNs	08
Unit-III	**Transfer Learning & Domain Adaptation:** Transfer Learning Scenarios, Applications of Transfer Learning, Transfer Learning Methods, Fine Tuning and Data Augmentation	06
Unit-IV	**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	05
Unit-V	**Miscellaneous:** Image Classification, Image Classification with Localization, Semantic Segmentation, Object Detection, Auto encoders and Stacked Auto encoders, Generative Adversarial Networks, Deep Reinforcement Learning	05

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents

Suggested Readings/ References:

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

Suggested List of Experiments:

Sr. No.	Title	Hours
1	Basics of Python, Numpy, Scikit-Learn, Matplotlib	02
2	Ex-OR implementation using backpropogation.	02
	Basics of Tensorflow and Keras ,	02
3	Conventional Feed Forward Neural Network on MNIST. Write code using Sequential Class.	02
4	Conventional Feed Forward Neural Network on MNIST. Write code using Model Class API.	02
5	Convolutional Neural Network on CIFAR10 Small Image Classification Dataset.	02
6	Convolutional Neural Network on CIFAR10 Small Image Classification Dataset using transfer learning.	02
7	Image Segmentation & Detection using Deep Networks.	02
8	Build a language model using RNN. Write functions to sample novel sentences and find the probability of input sentence. Also, use Recurrent Neural Network for Sentiment Analysis.	02
9	Recurrent Neural Network for Image Captioning	02
10	Project on any of the topic from miscellaneous.	02

Suggested Case List: -NA-