NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	BTech All (Other than CSE and EC)
Course Code:	3CS105IE24
Course Title:	Introduction to Deep Learning
Course Type:	Interdisciplinary Minor-Elective
Year of Introduction:	2024-25

L	T	Practical Component				C
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Course Learning Outcomes (CLO):

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

5. identify the strengths and weaknesses of the deep network (BL3)
6. analyse the suitability of different deep networks for problems in various domains (BL4)
7. interpret the functioning and math behind the deep learning architectures
8. choose deep networks for solving problems pertaining to computer science and interdisciplinary research. (BL5) (BL5)

Unit	Contents	Teaching Hours (Total 45)
Unit-I	**Basics of ANN:** Introduction to ANN, Training of ANN for its parameterization, CNN basic architecture, layer details, activation functions, loss functions, convolution operation, strides, and calculations	10
Unit-II	Batch Normalisation, binary classification, multi-class classification, and different architecture. Applications like Classification, Segmentation, and Localisation. Transfer Learning concepts and applications.	10
Unit-III	Introduction to recurrent neural networks (RNNs), Building a simple RNN model, Sequence learning and attention mechanisms, LSTM (Image Labelling), GRU	10
Unit-IV	Understanding Generative Adversarial Networks, Image Inpainting, Image Super Resolution, Colorization of Black and White Images, Human Face Generation, Text2Image, Music Generation	10
Unit-V	**Recent trends:** Variational Autoencoders, Multi-task Deep Learning, Multi-view Deep Learning. Applications: Vision, NLP, Speech, Text	05

Self-Study:

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

Suggested Readings/ References:

1. Zhang, Aston, et al. Dive into deep learning. Cambridge University Press
2. Glassner, Andrew. Deep learning: a visual approach. No Starch Press
3. Prince, Simon JD. Understanding Deep Learning. MIT Press
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press.

5. Adam Gibson, Josh Patterson, Deep Learning, O'Reilly Media, Inc.
6. Ronald T. Kneusel, Practical Deep Learning, No starch press.
7. Rajjan Shinghal, Pattern Recognition, Techniques and Applications, Oxford.
8. Tom Mitchell, Machine Learning, Tata McGraw Hill.

Suggested List of Experiments:

Sr. No.	Title	Hours
1	Kaggle: Titanic – Machine Learning from Disaster	02
2	Basics of Tensorflow and Keras	02
3	Conventional Feed Forward Neural Network on MNIST. Write code using (a) Sequential Class, (b) Model Class API	02
4	Kaggle: Digit Recognizer (Digit Recognizer Kaggle)	02
5	Kaggle: CIFAR-10 - Object Recognition in Images Use transfer learning.	04
6	Image Segmentation & Detection Using Deep Networks	04
7	Auto Encoders for Dimensionality Reduction	04
8	Build a language model using RNN. Write functions to sample novel sentences and find the probability of the input sentence. Also, the Recurrent Neural Network was used for Sentiment Analysis.	04
9	Recurrent Neural Network for Image Captioning	04
10	GAN for MNIST-like image generation	02