FACULTY OF ENGINEERING AND TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **M.TECH. ARTIFICIAL INTELLIGENCE**

Semester: **II**

Course Code: **2023102001**

Course Title: **Artificial Neural Networks and Deep Learning**

Course Group: **Core-III**

Course Objectives:

The course is aimed to learn concepts of artificial neural networks and use them for various learning and prediction applications. The course is also aimed to learn various deep learning techniques and use them for real-time applications like object recognition, text processing, etc.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	50/20	50/20	25/10	25/10	150/60

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction To Artificial Neural Networks Basic concepts of neural networks, Neural network architectures, activation functions, Basis learning rules, Learning single layer neural network, Multilayer neural network and Backpropagation, hyper parameters, Use of neural network for classification, regression, and clustering	12
2	Introduction To Deep Learning Introduction, Machine learning vs. deep learning, applications of deep learning, feature engineering, Deep learning frameworks, vanishing gradients	06
3	Convolutional Neural Networks Basic concepts of CNN: convolution, activation function, pooling, dropout, regularization, fully-connected, Architecture of CNN, Pre-trained CNN models, Transfer Learning, Applications of CNN, Variants of CNN	06
4	Recurrent Networks Sequential models, Recurrent Neural Networks (RNN), RNN models: Long-Short Term Memory, Gated Recurrent Unit	07
5	Advanced Concepts and Architectures Deep Autoencoders, Deep Generative Models, Capsule networks, Ensemble learning	05

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6	Case-study Applications: Object recognition, Character recognition, Image Captioning, Language Modeling, etc.	**04**

List of Practical's / Tutorials:

1	Implement single layer neural network
2	Perform classification using backpropagation
3	Study of Deep learning tool (Tensorflow, Pytorch,etc.)
4	Study of Keras Library for deep learning implementation
5	Perform object recognition using CNN
6	Understand and demonstrate working with Pre-trained networks
7	Study and apply transfer learning
8	Study of dimensionality reduction through Autoencoder
9	Study of Long-Short Term Memory
10	Study of Gated Recurrent Unit
11	Study of Generative Adversarial Network

Reference Books:

1	Simon Haykin, Neural Networks and Learning Machines, Pearson Prantice Hall, 2009
2	Jacek M. Zurada, Introduction to Artificial Neural Systems, PWS Publishing Company, 1995.
3	Christopher M. Bishop. Neural Networks for Pattern Recognition. Oxford University Press, 1996.
4	Patterson and Gibson, Deep Learning, O'reilly
5	Ian Goodfello, YoshuaBengio, and Aaron Courville, Deep learning, MIT Press, 2016.
6	Li Deng, Dong Yu, Deep learning Methods and applications, foundations and trends in signal processing.
7	AurélienGéron, Hands-On Machine Learning with Scikit-Learn and TensorFlow.
8	Antonio Gulli, Sujit Pal, Deep learning with keras.
9	Francois Chollet, Deep Learning with Python

Supplementary learning Material:	
1	NPTEL Deep Learning: https://nptel.ac.in/courses/106/106/106106184/
2	deeplearning.net, www.pyimagesearch.com, neuralnetworksanddeeplearning.com, deeplearning.ai

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

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Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
10%	40%	25%	10%	10%	05%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Study and identify the deep learning algorithms which are appropriate for various types of learning tasks in various domains.	**20**
CO-2	Use deep learning frameworks and solve real world problems	**30**
CO-3	Study and apply neural networks for classification and regression tasks	**20**
CO-4	Understand hyper parameter tuning.	**10**

Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025

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