Faculty of Engineering & Technology
Master of Technology (M. Tech)
(W. E. F.: 2023-24)

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Name of Faculty	:	Faculty of Engineering & Technology
Name of Program	:	Master of Technology (M.Tech.) – Artificial Intelligence and Data science
Course Code	:	2MAI01
Course Title	:	Deep Learning
Type of Course	:	Professional core
Year of Introduction	:	2023-24

Prerequisite	:	Deep learning is vast area of AI where the concepts are used
Course Objective	:	This course is aimed at imparting candidates for gives and understanding of the theoretical basis underlying neural networks and deep learning.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	Understand the fundamentals of Deep Learning.
	CO2	Familiarize with Neural Networks aspects.
	CO3	Recognize the tangible applications of ML and Neural Networks.
	CO4	To understand Derivatives and tensors, Stochastic gradient descents, Back propagation.
	CO5	To Learn Neural Networks, Convolution operation, Max pooling, Power of CNNs
	CO6	To learn to use LSTMs to synthesize text, Neural Style transfer and applications, Image synthesis with auto encoders

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**SEE**	**CIA**	**SEE**	**CIA**	
4	0	2	5	70	30	30	20	150

*Legends: **L**-Lecture; **T**–Tutorial/Teacher Guided Theory Practice; **P** – Practical, **C** – Credit, **SEE** – Semester End Examination, **CIA** - Continuous Internal Assessment (It consists ofAssignments/Seminars/Presentations/MCQ Tests, etc.))*

Course Content

Unit No.	Topics	Teaching Hours	Weightage	Mapping with CO
1	**The Fundamentals of Deep Learning:** Differentiate Deep Learning from machine learning, Evolution of AI, and ML: HistoricalEpochs, Deep Learning relevance. The matrixmagic: Scalars->Vectors->Matrices->Tensors. Real-world data representation. Tensor operations and visualization, Visualizing Deep Learning, Elephant in the room.	08	20%	CO1

2	**Gradient Descent:** Derivatives and tensors, Stochastic gradient descents, Back propagation: our very own chainrule of differentiation! **Layers:** the atoms of DL, Models: the molecules of DL, Loss functions, Optimizers, Activation Functions, Application and types, Deep Learning in Action, Multiclass Classification and Regression.Overfitting and underfitting.	08	20%	CO1
3	**Convolutional Neural Networks and Recurrent Neural Networks:** Introduction to Neural Networks, Convolution operation, Max pooling, Power of CNNs: abstraction across layers, reusing popular CNNS & fine-tuning. Recurrent Networks, LSTMs & GRU, Examples of simple RNNs, Complex recurrent neural networks: Overfitting in RNNs, Multi-layer RNNs, Multi-directional RNNs. Real- life examples: One-dimensional sequence processing, CNN+RNN.	09	20%	CO2 CO5
4	**Generative Deep Learning:** Using LSTMs to synthesize text, Neural Style transfer and applications, Image synthesis with auto encoders, Generative Adversarial Networks, Generator, Discriminator, Generatorvs Discriminator, Training GANs. MIMO Deep Learning models, Layers graphs: acyclic and directional, Bag of tricks: ensemble of models.	10	20%	CO3 CO4
5	**Tangential Topics of ML and Neural Networks:** Information-Theoretic Machine Learning, Hebbian Learning, Competitive Learning, Boltzmann Learning, Radial Basis Function Networks.	10	20%	CO2 CO5 CO6

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	**20**	**30**	**30**	**20**	**0**	**0**

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

Suggested Learning Websites

Sr. No.	Name of Website
1	https://aws.amazon.com/what-is/deep learning/#:~:text=Deep%20learning%20is%20a%20method,produce%20accurate%20insights%20and%20predictions .
2	https://www.ibm.com/topics/deep-learning
3	https://www.geeksforgeeks.org/introduction-deep-learning/

Reference Books

Sr. No.	Name of Reference Books
1	Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville
2	Grokking Deep Learning by Andrew W. Trask
3	Deep Learning for Coders with fastai and PyTorch by Jeremy Howard and Sylvain Gugger
4	Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence by Jon Krohn, Grant Beyleveld, and Aglaé Bassens