

Devi Ahilya University, Indore, India Institute of Engineering & Technology				MSc – II Year (Applied Mathematics) with Specialization in Computing & Informatics Semester- IV			
Subject Code & Name	Instructions Hours per Week			Credits			
AM4EC4: Machine Learning	L	T	P	L	T	P	Total
	3	-	-	3	-	-	3
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To introduce the theoretical foundations of machine learning & Deep Learning.
- To provide practical experience of applying machine learning & Deep Learning techniques
- To investigate new problems where machine learning techniques can do better.

Pre requisites: Basic knowledge of probability and statistics and computer programming.

COURSE OF CONTENTS

Unit-I Introduction:

Definition, Applications of machine learning, Machine Learning Workflow, Define Problem, Specify Inputs & Outputs, Exploratory Data Analysis, Data Collection, Data Preprocessing, Data Cleaning, Visualization, Model Design, Training, and Offline Evaluation, Model Deployment, Online Evaluation, and Monitoring, Model Maintenance, Diagnosis, and Retraining.

Unit-II

Machine Learning Algorithms:

Aspects of developing a learning system: Training Data, Validation Data and Test data, Types of learning: supervised, unsupervised and Reinforcement learning, Classification and Regression learning methods, Linear Regression with One Variable, Linear Regression with Multiple Variables, Logistic Regression, Support Vector Machine.

Unit-III

Introduction to Neural Networks:

Neural Network Representation, Perceptron, Artificial Neural Network, Backpropagation algorithm. Backpropagation Intuition, Random Initialization, Diagnosing Bias vs. Variance, Regularization and Bias/Variance. Learning Rate, implementing gradient descents, training neural networks, Cost Function.

Unit-IV

Deep Learning:

Introduction, Application, Deep neural network, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Fully Connected (FC) Layer, Convolutional neural networks, recurrent neural networks, Activation Function, Sigmoid, Rectified Linear Units (ReLU), tanh, SoftMax, Pooling Layer, Bias, Variance, Hyperparameters, Data Augmentation,

Unit-V

Convolutional Neural Networks:

Terminologies: Channels, pooling, Padding, Stride, Preparing the image, Generate filters, Convolve using filters Measuring performance, CNN models: LeNet, AlexNet, ResNet, MobileNet, YoLoAlgorithm, Recurrent Neural Networks, Generative Adversarial Networks.

Learning Outcomes:

Upon Completing the Course, students will have knowledge of various machine learning & Deep Learning techniques useful for solving the real world problems.

RECOMMENDED BOOKS

- [1] Michael Bowles, Machine Learning in Python, John Wiley & Sons, Inc., 2015
- [2] Jason Brownlee, Machine Learning Mastery With Python, 2016.
- [3] Machine Learning with TensorFlow, Version 10, 2017, Manning Publications.
- [4] Ian Goodfellow and YoshuaBengio and Aaron Courville, Deep Learning, MIT Press, 2016

