

As Per NEP 2020

University of Mumbai



Syllabus for Basket of OE Vertical 3

Faculty of Science

Board of Studies in Data Science

Second Year Programme

Semester

IV

Title of Paper

Credits

TensorFlow

2

From the Academic Year

2025-26

Title of Paper: TensorFlow

Sr. No.	Heading	Particulars
1	Description of the course: Including but not limited to:	The TensorFlow practical covers a hands-on approach to learning TensorFlow, providing fundamental concepts, model building, training, and deployment. TensorFlow is designed for data scientists, engineers, and researchers who want to build production-ready systems. By the end of the course, the learners will have a solid foundation in TensorFlow, ready to tackle real-world data challenges and enhance your big data processing skills.
2	Vertical:	Open Elective
3	Type:	Practical
4	Credit:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5	Hours Allotted:	60 Hours
6	Marks Allotted:	50 Marks
7	Course Objectives (CO): CO1: To understand the historical context and basics of TensorFlow including setting up the environment and working with tensors. CO2: To construct a deep learning model using TensorFlow's Keras Sequential API. CO3: Train deep learning models and evaluate their performance. CO4: Improve model performance using callbacks and regularization techniques. CO5: Apply TensorFlow skills to develop an image classification model.	
8	Course Outcomes (OC): OC1: Introduction TensorFlow: Understand the TensorFlow basics fundamentals. OC2: TensorFlow and Machine learning fundamentals: Install TensorFlow on computer machine and diving deep into Tensorflow API. OC3: Computation of Graph: Execute different types of joins and unions on Data-Frames to combine and analyze data from multiple sources. OC4: Building Model: Identify problem, collect data, Explore the data, Preprocess the data, Build the model, Set up the layers, Compile the Model, Train the Model, Feed the Model.	

9	Modules:	
	Module 1:	30 Hrs
	Introduction to TensorFlow and Setup: Introduction to TensorFlow, Strength of TensorFlow, Challenges of TensorFlow, Structure and Objective of TensorFlow, New feature of TensorFlow, anaconda Navigator, Classification with Iris dataset. Installation: Installing Visual Studio, Python 3, Installing TensorFlow, Installing Keras, Jupyter notebook and Matplotlib, Testing of all installations working, Perform a simple “Hello World” TensorFlow program, Perform basic TensorFlow operations. TensorFlow Basics and Computation Graphs: Introduction to computation graphs, Defining Computation Graphs in TensorFlow, Building your first computation graph in TensorFlow, Understanding Tensors, Operations and data flow, Variables, Placeholders, and constants, Graphs, Create and manage computation graphs, Basic TensorFlow programs Basic classification: Classify images of clothing: Import the Fashion MNIST dataset, Explore the data, Preprocess the data, Build the model, Set up the layers, Compile the Model, Train the Model, Feed the Model. Basic text classification: Sentiment Analysis: Download and explore the IMDB dataset, Load the dataset, prepare the dataset for training, Configure the dataset for performance, Create model, Loss function and optimizer, Train the Model, Evaluate the Model, Create plot of accuracy and loss overtime, Export model Text classification with TensorFlow Hub: Movie reviews: Download and explore the IMDB dataset, Load the dataset, prepare the dataset for training, Configure the dataset for performance, Create model, Loss function and optimizer, Train the Model, Evaluate the Model, Create plot of accuracy and loss overtime, Export model.	
	Module 2:	30 Hrs
	Building Neural Networks with TensorFlow: Common Components and Operations of Neural Networks, Training a Neural Network with TensorFlow, Implement a simple neural network for MNIST classification using gradient descent optimization Basic regression: Predict fuel efficiency: Download and explore the Auto MPG dataset, Get the data, Load the dataset, prepare the dataset for training, Configure the dataset for performance, Inspect the data, Split	

	features from labels, Normalization, Linear Regression with one variable, Linear Regression with multiple inputs, Regression with a Deep Neural Network (DNN), Regression using a DNN with single input, Regression using a DNN and multiple inputs, performance, make predictions. Overfit and underfit: Download and explore the Higgs dataset, Load the dataset, prepare the dataset for training, Demonstrate overfitting, Training procedure, Tiny, Small, Medium, Large Model, Plot the training and validation losses Building Object Recognition and Classification: Convolutional Neural Networks (CNN), Introduction to Convolutional Neural Network, convolution layer, MNIST with CNN, Training CNN on MNIST and CIFAR-10, Implementing CNNs from scratch in TensorFlow, Visualizing model performance Recurrent Neural Networks (RNN) and NLP Applications: Study sequence data and time series, Introduction to RNNs, LSTM Training an RNN for text generation, Implementing LSTM based sentiment analysis	
10	Textbooks: 1. Learning TensorFlow A Guide to Building Deep Learning Systems by Tom Hope, Yehezkel S. Resheff & Itay Lieder, 1st Edition, O'Reilly 2. Beginning Application Development with TensorFlow and Keras, by Luis Capelo, 1st Edition, Packt Publication, 2018. 3. Mastering TensorFlow 2.x, Implement Powerful Neural Nets across structured, unstructured datasets and Time Series by Rajdeep Dua, BPB publication.	
11	Reference Books: 1. Beginning with Deep Learning Using Tensorflow: A Beginners Guide to TensorFlow and Keras for Practicing Deep Learning Principles and Applications. 2. TensorFlow for Machine Intelligence A Hands-On Introduction to Learning Algorithms Sam Abrahams Danijar Hafner Erik Erwit. 3. https://www.tensorflow.org/tutorials/keras/classification#compile_the_model.	
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%

13	Continuous Evaluation through: Students are expected to attend each practical and submit the written practical of the previous session. Performing Practical and writeup submission will be continuous internal evaluation. 2.5 marks can be awarded for each practical performance and writeup submission totaling to 50 marks and can be converted to 20 marks.	30 marks practical exam of 2 hours duration
14	Format of Question Paper: Practical Slip: Q1. From Module 1 13 marks Q2. From Module 2 12marks Q3. Journal and Viva 05 marks	

Sd/-
Sign of the BOS
Chairman
Dr. Srivaramangai R
BOS in Data Science

Sd/-
Sign of the Offg.
Associate Dean
Dr. Madhav R. Rajwade
Faculty of Science &
Technology

Sd/-
Sign of the Offg. Dean
Prof. Shivram S. Garje
Faculty of Science &
Technology