INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
भारतीय प्रौद्योगिकी संस्थान तिरुपति
Yerpedu-Venkatagiri Road, Yerpedu Post, Tirupati District, Andhra Pradesh - 517 619

1.	Title of the course	Introduction to Data Science and Machine Learning
2.	Course number	ES109L
3.	Structure of credits (L-T-P-C)	2-1-0-3
4.	New course/modification to	New
5.	To be offered by	Computer Science and Engineering
6.	Proposed by	KALIDAS Y
7.	Prerequisite	None
8.	**Course Objective(s):** To explain the mathematical foundations of data science and machine learning. To discuss a few fundamental machine learning models. To demonstrate the approaches in selected benchmark data sets.	
9.	**Course Content:** Overview of Pattern Recognition System; Mathematical foundations: basics of linear algebra, probability and random variables, vector calculus; Optimization methods: gradient descent, Newton-Raphson; Programming in Python for machine learning; Loss formulation: hinge loss, divergence measures, cross entropy, linear and logistic regression loss, squared error, other forms; Data representation and feature engineering: types of data, data preprocessing, data visualization; feature selection, principal component analysis; Supervised learning: classification and regression metrics, k-nearest neighbor classifier, linear and logistic regression; Model of Neuron and Linear Perceptron Learning; Unsupervised learning: clustering metrics, k-means clustering, hierarchical clustering, other methods.	
10.	**Textbook(s):** 1. Duda R O, Hart P E, and Stork D G, Pattern Classification, 2nd Edition, John Wiley and Sons, (2001) 2. Deisenroth M P, Faisal A A, and Ong C S, Mathematics for Machine Learning, 1st Edition, Cambridge University Press, (2020)	
11.	**Reference(s):** 1. Theodoridis S and Koutroumbas K, Pattern Recognition, 4th Edition, Academic Press, (2008) 2. Geron A, Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 1st Edition, Shroff/O' Reilly (2017) 3. Shwartz S S and David S B, Understanding Machine Learning: From Theory to Algorithms, 1st Edition, Cambridge University Press (2014)	