

COURSE OUTCOMES OF DATA SCIENCE	
SEM-1	MATHS FOR DATA SCIENCE
CO-1	Fundamental properties of matrices, their norms, and their applications.
CO-2	Differentiating/Integrating multiple variable functions and the role of the gradient and the hessian matrix.
CO-3	Basic properties of optimization problems involving matrices and functions of multiple variables.
SEM-2	INTRODUCTION TO DATA SCIENCE WITH R
CO-1	Recognize various disciplines that contribute to a successful data science effort.
CO-2	Understand the processes of data science - identifying the problem to be solved, data collection, preparation, modeling, evaluation and visualization.
CO-3	Be aware of the challenges that arise in data sciences.
CO-4	Develop and appreciate various techniques for data modeling and mining.
CO-5	Be cognizant of ethical issues in many data science tasks.
CO-6	Be comfortable using commercial and open source tools such as the R language and its associated libraries for data analytics and visualization.
CO-7	Learn skills to analyze real time problems using R
CO-8	Able to use basic R data structures in loading, cleaning the data and preprocessing the
CO-9	Able to do the exploratory data analysis on real time datasets
CO-10	Able to understand and implement Linear Regression
CO-11	Able to understand and use - lists, vectors, matrices, dataframes, etc.
SEM-3	DATA MINING AND DATA ANALYSIS
CO-1	To understand and demonstrate data mining
CO-2	Compare various conceptions of data mining as evidenced in both research and application.
CO-3	Characterize various kinds of patterns that can be discovered by association rule mining.
CO-4	Evaluate mathematical methods underlying the effective application of data mining.
CO-5	To Analyze the data using statistical methods
CO-6	Gain hands-on skills and experience on data mining tools.
SEM-4 PAPER-4	BIG DATA TECHNOLOGY
CO-1	Learn tips and tricks for Big Data use cases and solutions.
CO-2	Acquire knowledge of HDFS components , Namenode, Datanode, etc.
CO-3	Acquire knowledge of storing and maintaining data in cluster, reading data from and writing data to Hadoop cluster.
CO-4	Able to maintain files in HDFS
CO-5	Able to write MapReduce applications to access data present on HDFS
CO-6	Able to read different formats of files into map-reduce application.
CO-7	Able to develop MapReduce applications to analyze Big Data related to the real world use cases.

CO-8	Able to write MapReduce applications that can take data from multiple datasets and join them
CO-9	Able to optimize the performance of Map-Reduce application
SEM-4 PAPER-5	BIG DATA ACQUISITION AND ANALYSIS
CO-1	Identify the various sources of Big Data
CO-2	Able to collect and store Big Data from various sources
CO-3	Able to write Pig Scripts- Extract, Transform and Load the data on HDFS
CO-4	Able to write Hive Scripts- Extract, Transform, Load and Analyse the data present in HDFS
CO-5	Able to write scripts to extract data from structured and un-structured data for analytics
CO-6	Able to extract and process semi and un-structured data using HBase
SEM-5 PAPER-6A	SOFT COMPUTING
CO-1	Understand the fundamental theory and concepts of neural networks .
CO-2	Illustrate the soft computing techniques like neural network and fuzzy logic and their roles in building intelligent systems
CO-3	Illustrate and implement the various learning rules
CO-4	Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
CO-5	Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
CO-6	Design and implement real life examples using fuzzy logic and genetic algorithms
SEM-5 PAPER-7A	AI CONCEPTS AND TECHNIQUES
CO-1	List the objectives and functions of modern Artificial Intelligence.
CO-2	Categorize an AI problem based on its characteristics and its constraints.
CO-3	Understand and implement search algorithms.
CO-4	Learn how to analyze the complexity of a given problem and come with suitable optimizations.
CO-5	Demonstrate practical experience by implementing and experimenting with the learnt algorithms
SEM-5 PAPER-6B	SUPERVISED MACHINE LEARNING
CO-1	Able to understand introduction to machine learning concepts.
CO-2	Able to Loading datasets, build models and model persistence.
CO-3	Understand Feature extraction from data sets.
CO-4	Able to do Regression & Classification. Able to compare SVM with other classifiers.

SEM-5 PAPER-7B	UNSUPERVISED MACHINE LEARNING
CO-1	Able to do Clustering, feature extraction and optimization.
CO-2	Students will be able to understand and implement in Python algorithms of Unsupervised Machine Learning and apply them to real-world datasets
SEM-5 PAPER-6C	ARTIFICIAL NEURAL NETWORK
CO-1	Create different neural networks of various architectures both feed forward and feed backward.
CO-2	Perform the training of neural networks using various learning rules.
CO-3	Perform the testing of neural networks and do the perform analysis of these networks for various pattern recognition applications.
SEM-5 PAPER-7C	DEEP LEARNING
CO-1	Solve problems in linear algebra, probability, optimization, and machine learning.
CO-2	The advantages and disadvantages of deep learning neural network architectures and other approaches.
CO-3	Implement deep learning models in Python using the PyTorch library and train them with real-world datasets.
CO-4	Design convolution networks for handwriting and object classification from images or video.
CO-5	Design recurrent neural networks with attention mechanisms for natural language classification, generation, and translation.