COURSE OUTCOMES

DEPARTMENT OF M.Sc. DATA SCIENCE

STRUCTURE OF THE SYLLABUS

PROGRAM NAME	COURSE	COURSE CODE	COURSE NAME
M Sc Data Science	Core I	P21DS101	Mathematical Foundation for Data Science
M Sc Data Science	Core II	P21DS102	Problem Solving using Python and R
M Sc Data Science	Core III	P21DS103	NOSQL Database Management
M Sc Data Science	Elective I	P21DS1:1	Essential Statistics for Data Science
M Sc Data Science	Core Practical I	P21DS1P1	Problem Solving using Python and R Lab
M Sc Data Science	Core Practical II	P21DS1P2	NoSQL Database Management Lab
M Sc Data Science	Core Practical III	P21DS1P3	Data Visualization Lab
M Sc Data Science	Core IV	P21DS204	Time Series Analysis and Forecasting
M Sc Data Science	Core V	P21DS205	Data and Visual Analytics
M Sc Data Science	Core VI	P21DS206	Practical Machine Learning
M Sc Data Science	Elective II	P21DS2:2	Natural Language Processing
M Sc Data Science	Elective II	P21DS2:3	Health Care Data Analytics
M Sc Data Science	Core Practical IV	P21DS2P4	Data and Visual Analytics Lab
M Sc Data Science	Core Practical V	P21DS2P5	Practical Machine Learning Lab
M Sc Data Science	Core Practical VI	P21DS2P6	Natural Language Processing Lab
M Sc Data Science	Core VII	P21DS307	Principles of Deep Learning
M Sc Data Science	Core VIII	P21DS308	Big Data Management and Analytics
M Sc Data Science	Core IX	P21DS309	Social Media Analytics
M Sc Data Science	Elective IV	P21DS3:4	Computer Vision
M Sc Data Science	Core Practical VII	P21DS3P7	Big Data Management and Analytics Lab
M Sc Data Science	Core Practical VIII	P21DS3P8	Social Media Analytics Lab
M Sc Data Science	Core Practical IX	P20DS3P9	Principles of Deep Learning Lab
M Sc Data Science	Core X	P21DS410	Programming using Javascript
M Sc Data Science	Elective V	P21DS4:A	Customer relationship Management
M Sc Data Science	Elective V	P21DS4:5	Supply Chain Management
M Sc Data Science	Core Practical X	P21DS4P10	Programming using Javascript Lab
M Sc Data Science	Core Project	P21DS4PJ	Core Project

CORE I: MATHEMATICAL FOUNDATION FOR DATA SCIENCE

Semester: I	Hours/Week: 5
Course Code: P21DS101	Credits: 4

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit
CO1	Solve systems of linear equations by use of the matrix	K5	I
CO2	Determining basis and understanding linear mappings of vector spaces	K5	I
CO3	Determine the Orthogonality and Projections	K5	II
CO4	Evaluate eigenvectors and eigenvalues	K5	III
CO5	Explain the properties gradients and PDE	K6	IV
CO6	Summarize different probability distributions	K6	V

CORE II: PROBLEM SOLVING USING PYTHON AND R

Semester:I	Hours/Week:5
Course Code:P21DS102	Credits:4

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit
CO1	Understand python basic syntax, usage of built in functions	K3	I
CO2	Understand conditional and looping statements and build user defined functions	K3	I
CO3	Manipulate files using Python	K3	II
CO4	Develop object oriented programs in Python	K4	III
CO5	Access internet and database data	K5	IV
CO6	Understand R basic data structures and develop programs	K3	V

Core III: NOSQL Database Management

Semester: I   Hours/Week: 5

Course Code: P21DS103   Credits: 3

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit
CO1	Construct the Queries and sub queries in SQL	K6	I
CO2	Construct queries to retrieve the data from more than one tables using different techniques.	K6	II
CO3	Design and Analyse different techniques and operations in Mango DB	K6	III
CO4	Assess various operators and clause to generate unstructured data	K5	IV
CO5	Choose different indices to retrieve data	K5	IV
CO6	Construct databases using SQL, MongoDB and Neo4J	K6	V

ELECTIVE-1: ESSENTIAL STATISTICS FOR DATA SCIENCE

Semester: I   Hours/Week: 5

Course Code: P21DS1:1   Credits: 4

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit
CO1	Experiment the methods of descriptive statistics and variability.	K5	I
CO2	Assess and examine the different tests of the statistical inferences	K5	II
CO3	Build the nonparametric statistics methods	K6	III
CO4	Classify and Construct the different types of regression methods for data analytics	K6	IV
CO5	Analyze the different properties of the regression methods.	K6	V
CO6	Evaluate all possible regression on given data sets.	K6	V

CORE PRACTICAL I: PROBLEM SOLVING USING PYTHON AND R LAB
Semester:I   **Hours/Week : 4**
Course Code : P21DS1P1   **Credits: 4**

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Activity
CO1	Write simple Python programs using Python data structures	**K6**	**1-5**
CO2	Manipulate files using Python	**K6**	**6**
CO3	Develop object oriented programs in Python	**K6**	**7-8**
CO4	Access internet and database data	**K6**	**9-12**
CO5	Write R programs for data visualization	**K6**	**13**
CO6	Creating dashboards using Tableau	**K6**	**14-15**

CORE PRACTICAL II:MYSQL DATABASE MANAGEMENT LAB
Semester: I   **Hours/Week: 4**
Course Code : P21DS1P2   **Credits: 4**

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Exercise Covered
CO1	Build a Table using SQL Queries and perform the basic operation	**K6**	**1,2**
CO2	Construct a SQL queries to evaluate various operators	**K6**	**3,4**
CO3	Evaluate the result using Subquery and Join techniques	**K6**	**5,6,7,8**
CO4	Assess the basic Queries in NoSQL using Mango DB	**K5**	**9,10,11**
CO5	Review the SQL, NoSQL and Neo 4J Graph data base	**K5**	**12**
CO6	Design a Graph database for Movie and Flight Data	**K6**	**13,14**

CORE PRACTICAL III: DATA VISUALIZATION LAB

Semester: I **Hours/Week: 3**
Course Code: P21DS1P3 **Credits: 3**

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Exercise Covered
CO1	Connect and prepare data using Tableau Desktop	K6	1
CO2	Explore and Analyze data using Data Prep tools	K6	2,3
CO3	Share insights through Tableau Public	K6	4
CO4	Prepare and model data using Power BI and Power Query	K5	5,6
CO5	Visualise and analyse data using Power BI tools	K5	7,8
CO6	Deploy and manage deliverables using Power BI service	K6	9

CORE IV: TIME SERIES ANALYSIS AND FORECASTING

Semester: I **Hours/Week: 5**
Course Code : P21DS204 **Credits: 4**

At the end of this course, the students will be able to

Sl.No.	Course Outcomes	Level	Unit
CO1	Solve the stationarity, trending and detrending of time series data	K6	1
CO2	Assess the features of the ARMA Models and estimation techniques	K5	2
CO3	Explain the ARIMA models and SARMA Models	K6	3
CO4	Summarize the characteristics of Spectral behaviour and periodic behaviour of the time series	K6	4
CO5	Compile the behaviour of smoothing in DLMS	K6	5
CO6	Design the Timeseries models using R for different time series data	K6	All

CORE V: DATA AND VISUAL ANALYTICS	
Semester: I	**Hours/Week : 5**
Course Code : P21DS205	**Credits: 4**

At the end of this course, the students will be able to

S.No.	Course Outcomes	Level	Unit
CO1	Test the NumPy functions for array processing	**K6**	**I**
CO2	Create time series plots using the Date and Time classes	**K6**	**II**
CO3	Interpret the Plotting of the dataset and time series	**K6**	**III**
CO4	Perform data aggregation and group operations	**K6**	**IV**
CO5	Create and use Series and Data Frames for data wrangling	**K6**	**V**
CO6	Create various plots using Matplotlib and Seaborne	**K6**	

CORE VI: PRACTICAL MACHINE LEARNING	
Semester: I	**Hours/Week: 5**
Course Code: P21DS206	**Credits: 4**

At the end of this course, the students will be able to

CO.NO	Course Outcome	Level	Unit
CO1	Perceive the Types of ML and develop Perceptron model	**K6**	**I**
CO2	Develop a supervised ML model for the given business problem	**K5**	**II**
CO3	Assess the pre-processing methods and reduce dimensions of data	**K6**	**III**
CO4	Evaluate the training and the testing of the designed ML model	**K6**	**IV**
CO5	Develop an unsupervised ML model for the given business problem	**K5**	**V**
CO6	Deploy machine learning models into production environment	**K6**	**All**

Elective II: NATURAL LANGUAGE PROCESSING

Semester: I **Hours/Week: 5**
Course Code: P21DS2:2 **Credits: 4**

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit
CO1	Experiment with text pre-processing and classification	K6	I
CO2	Create language models and POS tagging	K6	II
CO3	Evaluate the context free grammars and parse sentences	K6	III
CO4	Validate the meaning of sentences	K6	IV
CO5	Explain the Dependency parsing	K6	IV
CO6	Design NLP applications	K6	V

ELECTIVE-3: HEALTH CARE DATA ANALYTICS

Semester: I **Hours/Week : 3**
Course Code : P21DS2:3 **Credits: 4**

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit
CO1	Explain the Coding system of Electronic Health Records	K5	I
CO2	Develop the algorithms for Biomedical Analysis	K5	I
CO3	Design the Algorithm for Healthcare Data using NLP, SMA	K6	III
CO4	Construct the predictive models for Healthcare Data	K6	IV
CO5	Analyze the role of Analysis in Pervasive Health	K5	V
CO6	Design the Computer-Assisted Medical Image Analysis Systems	K6	V

CORE PRACTICAL IV: DATA AND VISUAL ANALYTICS LAB

Semester: I	**Hours/Week: 3**
Course Code: P21DS2P4	**Credits: 2**

At the end of this course, the students will be able to

CO.NO.	Course Outcome	Level	Activity
CO1	Create data analytics systems using Numpy	K6	1, 2
CO2	Create data wrangling systems using Pandas	K6	3-6, 10
CO3	Create data visualization systems using Seaborn	K6	7
CO4	Crate time series analysis systems using Pandas time series	K6	8
CO5	Create interactive dashboards using Tableau	K6	11
CO6	Build and deploy end to end data analytics product at client site	K6	9, 12

CORE PRACTICAL V: PRACTICAL MACHINE LEARNING LAB

Semester: I	**Hours/Week: 3**
Course Code : P21DS2P5	**Credits: 2**

At the end of this course, the students will be able to

CO.NO.	Course Outcome	Level	Activity
CO1	Practice data and file formats; visualize data and familiarize Colab and Azure	K6	1
CO2	Build and deploy systems for business problems based on regression models	K6	3,4
CO3	Build and deploy systems for business problems based on classification models	K6	2,5,7,8
CO4	Build and deploy systems for business problems based on predictive analytics	K6	6
CO5	Build and deploy systems for business problems based on tree models	K6	9,10
CO6	Build and deploy systems for business problems based on clustering models	K6	11

CORE PRACTICAL VI: NATURAL LANGUAGE PROCESSING LAB	
Semester: I	Hours/Week: 3
Course Code: P21DS2P6	Credits: 2

At the end of this course, the students will be able to

CO.NO.	Course Outcome	Level	Activity
CO1	Design systems to perform NLP pre-processing and document similarity	K6	1 - 5
CO2	Design NLP systems for spam filtering	K6	6
CO3	Design NLP systems for sentiment analysis	K6	7
CO4	Design NLP systems using tagging and named entity recognition	K6	8 - 10
CO5	Design NLP systems using Context free grammars	K6	11 - 14
CO6	Design NLP systems using SpaCy	K6	15

CORE VII: PRINCIPLES OF DEEP LEARNING	
Semester: III	Hours/Week: 5
Course Code : P21DS307	Credits:4

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit
CO1	Understand and apply the foundational concepts of Deep Learning	K4	I
CO2	Solve real world applications using MLP and improve its performance	K5	II
CO3	Develop CNN models and optimize the performance for CNN applications	K6	III
CO4	Develop RNN models and optimize the performance for RNN applications	K6	IV
CO5	Develop Auto encoders and GAN models for real time applications	K6	V
CO6	Design CNN and RNN architectures for real world applications	K6	V

CORE VIII: BIG DATA MANAGEMENT AND ANALYTICS

Semester: III   **Hours/Week: 5**
Course Code: P21DS308   **Credits: 4**

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit
CO1	Perceive Big Data concepts and technologies	K6	I
CO2	Evaluate the Storing and manipulation of data using HDFS	K6	II
CO3	Construct the very large datasets using Pig	K6	III
CO4	Create MapReduce using Spark	K6	IV
CO5	Formulate Data Warehousing operations using Hive	K6	V
CO6	Create applications using Hadoop	K6	All

CORE IX: SOCIAL MEDIA ANALYTICS

Semester: III   **Hours/Week: 4**
Course Code : P21DS309   **Credits: 4**

At the end of this course, the students will be able to

CO.NO	Course Outcome	Level	Unit
CO1	Explain the essentials of graphs for social networks	K6	I
CO2	Measure social network nodes and simulate social network models	K6	II
CO3	Evaluate the community analysis of social networks	K6	III
CO4	Measure and model information diffusion and homophily in social networks	K6	IV
CO5	Develop recommender systems and predict user behaviours	K6	V
CO6	Build and deploy end to end products into production environment	K6	All

ELECTIVE IV: COMPUTER VISION

Semester: III   **Hours/Week: 4**
Course Code: P21DS3:4   **Credits: 4**

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit
CO1	Learn image coordinates, transformations and image processing concepts	K2	I
CO2	Apply feature and edge detection methods	K3	II
CO3	Apply image and video understanding methods on humans	K3	III
CO4	Apply image alignment and stitching methods on 2D and 3D images	K3	IV
CO5	Understand and apply motion and pose estimation methods for images	K2	IV
CO6	Understand the applications of computer vision	K2	V

CORE PRACTICAL VII: BIG DATA MANAGEMENT AND ANALYTICS LAB

Semester: III   **Hours/Week: 5**
Course Code P21DS3P7   **Credits: 2**

At the end of this course, the students will be able to

CO.NO	Course Outcome	Level	Exercise
CO1	Develop applications using Hadoop	K6	1,2
CO2	Store and manipulate data using HDFS	K6	3
CO3	Data manipulation using MapReduce	K6	4,5 & 6
CO4	Explore very large datasets using Pig	K6	8,9
CO5	Perform Data Warehousing operations using Hive	K6	10
CO6	Perform data analytics using Spark	K6	7

CORE VIII: SOCIAL MEDIA ANALYTICS LAB

Semester: III
Course Code: P21DS3P8

Hours/Week: 5
Credits: 2

At the end of this course, the students will be able to

CO.NO.	Course Outcome	Level	Activity
CO1	Create data analytics systems using the data crawled from Twitter	K6	1 - 4
CO2	Create data analytics systems using the data crawled from Facebook	K6	5, 6
CO3	Create data analytics systems using the data crawled from Linkedin	K6	7
CO4	Create data analytics systems using the data crawled from GitHub	K6	8, 9
CO5	Create data analytics systems using the data crawled from Instagram	K6	10, 11
CO6	Create data analytics systems on bigdata collections	K6	12-14

CORE LAB IX: PRINCIPLES OF DEEP LEARNING LAB

Semester: III
Course Code: P20DS3P9

Hours/Week: 4
Credits: 2

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Activity
CO1	Develop Artificial Neural Networks using Perceptron	K6	1-3
CO2	Develop ANN using Multilayer Perceptron	K6	4-6
CO3	Create Custom datasets and develop ANN using MLP	K6	7-11
CO4	Develop Convolutional Neural Networks and advanced CNN	K6	12-15
CO5	Develop Recurrent Neural Networks, LSTM and GRU	K6	16-19
CO6	Develop and deploy deep neural networks as web / mobile service	K6	20

CORE X: PROGRAMMING USING JAVASCRIPT

Semester: IV	Hours/Week: 5
Course Code : P21DS410	Credits: 4

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Levels	Unit
CO1	Solve problems using the function programming features	K3	I
CO2	Apply OOP features to develop advanced Javascript code	K4	II
CO3	Demonstrate and apply Document Object Model and asynchronous programs	K5	III
CO4	Develop interactive websites using HTML, Javascript and AJAX	K5	IV
CO5	Create NoSQL databases and perform CRUD operations	K6	V
CO6	Connecting Mongoose for create databae	K6	V

ELECTIVE-5: SUPPLY CHAIN MANAGEMENT

Semester: IV	Hours/Week: 5
Course Code: P21DS4:5	Credits: 4

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit
CO1	Perceivethe foundations of a supply chain and explore strategies and logistics drivers by which the supply chain of an organization can be managed to enhance its business competitiveness.	K6	I
CO2	Evaluate and Analytically examine the strategic drivers and metrics of supply chain organizations and measure performance improvement	K6	II
CO3	Design and provide a network to support the business decision-making within the context of supply chain management and the real world.	K5	III
CO4	Plan optimized transportation and logistics activities in supply chain operations	K6	IV
CO5	Determine the outsourcing decisions by applying the buy-make framework to manage the benefit and risks of outsourcing	K6	V
CO6	Recommend a proper blend of Logistics and Supply elements thereby confining the wide range of applications in the changing dynamic environment and industry practices	K6	V

CORE LAB X: PROGRAMMING USING JAVASCRIPT LAB

Semester: III   **Hours/Weeks: 5**

Course Code: P21DS3P8   **Credits: 3**

At the end of this course, the students will be able to

CO.NO	Course Outcome	Level	Activity
CO1	Create data analytics systems using the data crawled from Twitter	K6	1 - 4
CO2	Create data analytics systems using the data crawled from Facebook	K6	5, 6
CO3	Create data analytics systems using the data crawled from Linkedin	K6	7
CO4	Create data analytics systems using the data crawled from GitHub	K6	8, 9
CO5	Create data analytics systems using the data crawled from Instagram	K6	10, 11
CO6	Create data analytics systems on bigdata collections	K6	12-14