Semester-I M. Tech. CSE (BDA)

Sr. No	Course Code	Course Title	TOTAL Hours			Credits	Maximum Marks		Total	Minimum Passing Marks	No. of Hrs for ESE
			L	T	P		Continual Assessment	End Sem Examination			
1	26BD101T	Fundamentals of Data Analytics	3	-	-	3	40	60	100	50	3
2	26BD102T	Artificial Intelligence and Machine Learning	3	-	-	3	40	60	100	50	3
3	26BD103T	Data Engineering Foundation	3	-	-	3	40	60	100	50	3
4	26BD104T	Program Elective-I	3	-	-	3	40	60	100	50	3
5	26BD105P	Technical Seminar-I	-	-	8	4	50	-	50	25	-
6	26BD106P	Mini Project-I	-	-	8	4	50	-	50	25	-
Total			12	-	16	20	260	240	500	-	-

Program Elective-I	
26BD104T (i)	Data Science for Engineers
26BD104T (ii)	Big Data Computing

FIRST SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26BD101T	Fundamentals of Data Analytics	3	-	-	3	40	60	100

Course Objectives	Course Outcomes
This course is intended 1. Learn the need for Data Analytics 2. Understand the methods of problem solving 3. Learn Modelling in Spreadsheet 4. Get introduced to data wrangling 5. Learn basic statistical methods	**At the end of the Course, the Student will be able to:** 1. Understand the significance of Data Science and use of essential tools for data analytics 2. Enhance problem solving and decision-making skills. 3. Learn various formals related to spreadsheet and data wrangling. 4. Understand the statistics fundamentals for data distribution. 5. Understand the importance of hypothesis testing and fundamentals of maths for data analytics

Unit I **[9Hrs]**

INTRODUCTION TO DATA ANALYTICS: What is Data Science and why is it so important? Overview of Data Science and Analytics, Industry Scenario, Various profiles available, Various Tools used

Unit II **[7Hrs]**

PROBLEM SOLVING TECHNIQUES: Introduction to Problem-solving, Decision-making methods, Problem solving frame work, Strategies of overcoming biases, Action Planning

Unit III **[7Hrs]**

SPREADSHEET MODELLING & DATA WRANGLING: Excel formula and functions, Data connections in Microsoft Excel, Data summarization using Pivot table, Data Modelling using Power Pivot, Data Preprocessing using Power Query

Unit IV **[6Hrs]**

DESCRIPTIVE AND INFERENTIAL STATISTICS: Basic of Business Statistics, Fundamentals of Descriptive Statistics, Measures of central tendency, Types of data distribution

Unit V **[7Hrs]**

PROBABILITY AND HYPOTHESISTESTING: Introduction to Probability, Union and Intersection in probability, Confidence Interval, Hypothesis testing- T-Test,Z-Test, One-way ANOVA

MATHEMATICS FOR DATA ANALYTICS: Introduction to Regression, Concept of R-Square, Concept of RMSE, Area under curve, Confusion matrix, recall value.

Text Books

S. No	Title	Authors	Edition	Publisher
1	Data Analytics: Principles, Tools and Practice	Dr. Gaurav Aroraa, Chitra lele	2nd Edition	BPB Publication
2	Data Analytics	Anil Maheshwari	3rd Edition	McGraw Hill

Reference Books

S. No	Title	Authors	Edition	Publisher
1	Fundamentals of Data Analytics	Prof. Dipanjan Kumar Dey	1st	Sankalp Publication
2	Basic of Data Analytics	Richa Mishra	3rd	Notion Press

SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26BD102T	Artificial Intelligence and Machine Learning	3	-	-	3	40	60	100

Course Objectives	Course Outcomes
This course is intended 1. to determine the machine learning approach for modelling. 2. to build predictive machine learning model. 3. to improve prediction models using scientific methods. 4. to build recommendation systems for various products.	**At the end of the Course, the Student will be able to:** 1. Understand the concepts of supervised and unsupervised learning algorithms. 2. Select and evaluate metrics for feature engineering. 3. Learn the concepts of AI. 4. Use TensorFlow in Neural networks. 5. Learn the concepts of deep learning and recommendation system.

Unit I **[9Hrs]**

SUPERVISED MACHINE LEARNING ALGORITHMS: Introduction to Machine Learning, Data Wrangling and Manipulation for Machine Learning, Exploratory Data analysis:Data preprocessing, Data Transformation, Data Reduction, Regression Techniques: Simple and Multiple Linear Regression, Classification techniques: Logistic Regression, Decision trees, Ensemble techniques.
UNSUPERVISED MACHINE LEARNING ALGORITHMS: Clustering Techniques: Hierarchical clustering, K-Means clustering, Anomaly Detection, Principal Component Analysis(PCA), Dimensionality Reduction, Need for dimensionality reduction

Unit II **[7Hrs]**

MODEL SELECTION AND FEATURE ENGINEERING: Evaluation Metrics in Regression and Classification, FeatureSelection Techniques, Handling Imbalance data, Hyperparameter Optimization Tuning, Ridge and Lasso Regression

Unit III **[7Hrs]**

INTRODUCTION TO AI: Introduction and History of Artificial Intelligence, AI in Business, Agent vs Environment Relationship, AI in DataScience

Unit IV **[6Hrs]**

TENSOR FLOW AND NEURAL NETWORKS: Introduction to TensorFlow, Installation of TensorFlow, Eagerexecution, Variables, Automatic differentiation, Graphs and functions, modules, layers and models, Introduction to NeuralNetworks, Perceptron models, Activation and Loss functions, Gradient Descent, Batch Normalization

Unit V **[7Hrs]**

DEEP LEARNING ALGORITHMS- ANN, CNN: Introduction Artificial Neural Network, Stochastic Gradient Descent, ANN learning, Building ANN models, Back propagation, classification using ANN, Introduction to CNN, Relu layer, pooling, flattening, Full connections, Building CNNmodels, accuracy of Models, Image classification using CNN
RECOMMENDATION SYSTEM: Introduction to Recommendation systems, User and Item based filtering, Collaborative filtering, Content based filtering,Building Recommendation Engines, Association Rule, AprioriAlgorithm, FP growth

Text Books

S. No	Title	Authors	Edition	Publisher
1	Artificial Intelligence and Machine Learning: Theory and Practice	Lyla Das, Sudhish George		IR
2	Machine Learning with Tensor Flow	Nishant Shukla		O'Reilly

Reference Books

S. No	Title	Authors	Edition	Publisher
1	Deep Learning	Josh Patterson, Adam Gibson		O'Reilly
2	Neural Networks and Deep Learning	Pat Nakamoto		Createspace Independent Publishing

		July 2026	2.0	Applicable for 2026-27
Chairman - BoS	Dean – Academics	Date of Release	Version	

FIRST SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26BD103T	Data Engineering Foundation	3	-	-	3	40	60	100

Course Objectives	Course Outcomes
This course is intended 1. to learn data management foundations 2. to understand managing databases with SQL 3. to understand managing databases using MongoDB 4. to learn the concept and fundamentals of data warehousing.	**At the end of the Course, the Student will be able to:** 1. Learn the concepts of SQL 2. Perform different SQL commands on database. 3. Acquire the knowledge of MongoDB and its related functions. 4. Understand MongoDB compass features. 5. Understand the importance of Data Warehouse.

Unit I **[9Hrs]**

DATABASE MANAGEMENT USING SQL: Introduction to SQL, SQL table, field, records, constraints, datatypes and operators. Introduction to Work Bench, creating, using and dropping databases, creating, using and dropping tables, inserting records in tables,

Unit II **[7Hrs]**

SQL Commands - BETWEEN,LIMIT, ORDER, GROUPBY, DISTINCT, UPDATE and DELETE importing csv files, SQL query commands- select, where, where with AND, OR, IN, LIKE

Unit III **[7Hrs]**

NOSQL QUERY USING MONGODB: Introduction to MongoDB, MongoDB vs SQL, Installation of MongoDB, Creating database in MongoDB, Creating collection inMongoDB, Interesting records in Mongo BD, MongoDB aggregation function, aggregation in mongo DB, Pipeline function in MongoDB, Schema in MongoDB

Unit IV **[6Hrs]**

INTRODUCTION TO MONGODB COMPASS: Introduction to MongoDB and MongoDB campus, Mongo DB –SQL Queries, Importing external data in Mongo DB, Mongo DBvisualization

Unit V **[7Hrs]**

INTRODUCTION TO DATA WAREHOUSE: Introduction to Data Warehouse, Characteristics of datawarehouse, Need of data warehouse, Benefits of data warehouse, Open databases vs data warehouse.

Text Books

S. No	Title	Authors	Edition	Publisher
1	Fundamentals Of Data Engineering: Plan and Build Robust Data Systems	Reis, Joe Housley, Matt		Shroff Publishers & Distributors Pvt Ltd (Spd)
2	Data Engineering with Python	Martin Kleppmann		O'Reilly

Reference Books

S. No	Title	Authors	Edition	Publisher
1	COMPLETE REFERENCE SQL	GROFF, JAMES R WEINBERG, PAUL N		TATA MCGRAW- HILL PUBLISHING COMPANY LIMITED
2	MONGODB IN ACTION	BANKER, KYLE BAKKUM, PETER VERCH, SHAUN GARRETT, DOUGLAS		DREAMTECH PRESS

FIRST SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26BD104T(i)	Data Science for Engineers	3	-	-	3	40	60	100

Course Objectives	Course Outcomes
This course is intended 1. Introduce R as a programming language 2. Introduce the mathematical foundations required for data science 3. Introduce the first level data science algorithms 4. Introduce a data analytics problem solving framework 5. Introduce a practical capstone case study	**At the end of the Course, the Student will be able to:** 1. Describe a flow process for data science problems (Remembering) 2. Classify data science problems into standard typology (Comprehension) 3. Develop R codes for data science solutions (Application) 4. Correlate results to the solution approach followed (Analysis) 5. Assess the solution approach (Evaluation) 6. Construct use cases to validate approach and identify modifications required (Creating)

NPTEL Course: - Data Science for Engineers
By Prof. Ragunathan Rengasamy, Prof. Shankar Narasimhan | IIT Madras

Week 1: Course philosophy and introduction to R
Week 2: Linear algebra for data science
1. Algebraic view - vectors, matrices, product of matrix & vector, rank, null space, solution of over-determined set of equations and pseudo-inverse)
2. Geometric view - vectors, distance, projections, eigenvalue decomposition

Week 3: Statistics (descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates)
Week 4: Optimization
Week 5: 1. Optimization
2. Typology of data science problems and a solution framework
Week 6: 1. Simple linear regression and verifying assumptions used in linear regression
2. Multivariate linear regression, model assessment, assessing importance of different variables, subset selection
Week 7: Classification using logistic regression

Week 8: Classification using KNN and k-means clustering

Text Books

S. No	Title	Authors	Edition	Publisher
1	Data Analytics: Principles, Tools and Practice	Dr. Gaurav Aroraa, Chitra lele	2nd Edition	BPB Publication
2	Data Analytics	Anil Maheshwari	3rd Edition	McGraw Hill

FIRST SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26BD105P	Technical Seminar - I	-	-	8	4	50	-	50

Course Objectives	Course Outcomes
This course is intended To provide an opportunity to the students to explore and deepen their knowledge in emerging technologies.	**Students will be able to** 1. Enhance knowledge and critical thinking 2. Improve presentation skills 3. Learn new research skills and problem-solving technique. 4. Increase their confidence

Student need to present seminar on various emerging technologies to explore and deepen their knowledge in a specific technical field, trends, and industry advancements, enabling them to enhance their expertise, critical thinking, and problem-solving skills within the chosen domain.

FIRST SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26BD106P	Mini Project - I	-	-	8	4	50	-	50

Course Objectives	Course Outcomes
This course is intended To provide an opportunity for the students to apply the knowledge, develop the skills and provide hands-on experience on a practical based project.	**Students will be able to** 1. Apply theoretical knowledge to address real-world problems, showcasing research, problem-solving, and critical thinking skills. 2. Effectively communicate project findings and demonstrate proficiency in project management and interdisciplinary learning. 3. Develop practical experience, ethical considerations, and the ability to adapt to challenges in a hands-on learning environment. 4. Develop the ability to document the progress, methodologies and results effectively in the form of project report.

Student need to build a project by ssuccessfully applying their academic knowledge to solve practical problems, demonstrating research, critical thinking, communication skills in a real-world context and prepare the project report.