ALAGAPPA UNIVERSITY

(A State University Established in 1985)

Karaikudi - 630003. Tamil Nadu, India

FACULTY OF EDUCATION

ALAGAPPA INSTITUTE OF SKILL DEVELOPMENT

PG DIPLOMA IN BIG DATA ANALYTICS

REGULATIONS AND SYLLABUS

(For the candidates admitted from the Academic Year 2022 - 2023)

POST-GRADUATE DIPLOMA PROGRAMME

in

BIG DATA ANALYTICS

under

CHOICE BASED CREDIT SYSTEM (CBCS)

&

CREDIT FRAMEWORK FOR SKILL DEVELOPMENT (CFSD)

COURSE PATTERN

(2018-19 Batch onwards)

ALAGAPPA INSTITUTE OF SKILL DEVELOPMENT

ALAGAPPA UNIVERSITY

(Accredited with A+ Grade by NAAC (CGPA: 3.64) in the Third Cycle &
Graded as Category – I University by MHRD-UGC)

KARAIKUDI – 630003

Tamil Nadu

ALAGAPPA INSTITUTE OF SKILL DEVELOPMENT
ALAGAPPA UNIVERSITY, KARAIKUDI.
SYLLABUS UNDER CBCS PATTERN (w.e.f. 2018-19)
Post-Graduate Diploma in Big Data Analytics

Degree	Sem	Subject code	Courses	Course Name	T/P	Credits Skill	Credits General	Hrs./Week	Marks Int.	Marks Ext	Total
Post-Graduate Diploma in Big Data Analytics	I	7BD1C1	**Core-I**	Fundamentals of Big Data Analytics	T	5	--	5	25	75	100
		7BD1C2	**Core-II**	Advanced Computing for Big Data Analytics	T	4	--	4	25	75	100
		7BD1P1	**Core-III**	Programming with Python – Lab	P	5	--	5	40	60	100
		7BD1P2	**Core-IV**	Programming with R - Lab	P	4	--	4	40	60	100
		7BD1G1	**General-I**	Marketing Analysis	T	--	4	4	25	75	100
		7BD1G2	**General-II**	Mathematical logics for Analytics	T	--	4	4	25	75	100
		7SD1E1 / 7SD1E2 / 7SD1E3	**DSE-I**	**Elective – I**	T	--	4	4	25	75	100
				Sub-Total		**18**	**12**				
				Total for Semester - I		**30**		**30**	--	--	**700**
	II	7BD2C1	**Core-V**	Advanced Big Data Technologies	T	4	--	4	25	75	100
		7BD2C2	**Core-VI**	Algorithms for Advanced Analytics	T	4	--	4	25	75	100
		7BD2C3	**Core-VII**	Big Data Security and Risk Analysis	T	4	--	4	25	75	100
		7BD2P1	**Core-VIII**	.Data Analytics with HADOOP - Lab	P	3	--	3	40	60	100
		7BD2MP	**Core-IX**	**Mini-Project**		3	--	3	100	--	100
		7BD2G3	**General-III**	Web Intelligence and Social Network Analysis	T	--	4	4	25	75	100
		7SD2E1 / 7SD2E2 / 7SD2E3	**DSE-II**	**Elective – II – Lab**	P	--	4	4	40	60	100
		7SD2E4 / 7SD2E5 / 7SD2E6	**DSE-III**	**Elective – III**	T	--	4	4	40	60	100
				Sub-Total		**18**	**12**				
				Total for Semester – II		**30**		**30**	--	--	**800**

Elective – I
1. Programming Concepts for Data Analytics – 7SD1E1
2. Principles of RDBMS & NoSQL – 7SD1E2
3. Multivariate Techniques for Data Analysis – 7SD1E3

Elective – II – Lab
1. RDBMS & NoSQL - Lab – 7SD2E1
2. Advanced MS-Excel for Data Analytics - Lab– 7SD2E2
3. Web Designing Technologies - Lab – 7SD2E3

Elective – III

1. Corporate Etiquette Skills   –   7SD2E4
2. Decision Management Systems   –   7SD2E5
3. Information Storage Management   –   7SD2E6

Semester-I						
Core I	**Course Code**	**FUNDAMENTALS OF BIG DATA ANALYTICS**	**T**		**C**	**H/W**
	7BD1C1				**5**	**5**
Unit -I						
Objective1	**To know the fundamental concepts of big data and analytics.**					
INTRODUCTION TO DATA SCIENCE: Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL						
Outcome 1	**Work with big data tools and its analysis techniques**					**K1&K2**
Unit - II						
Objective 2	**To explore tools and practices for working with big data**					
MODELING METHODS: Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes – Memorization Methods – Linear and logistic regression – unsupervised methods.						
Outcome 2	**Analyze data by utilizing clustering and classification algorithms**.					**K3**
Unit - III						
Objective 3	**To learn about stream computing.**					
INTRODUCTION TO R: Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution						
Outcome 3	**Learn and apply different mining algorithms and recommendation systems for large volumes of data**					**K4**
Unit IV						
Objective 4	**To know about the research that requires the integration of large amounts of data.**					
MAP REDUCE: Introduction – distributed file system – algorithms using map reduce, Matrix- Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop Map Reduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution.						
Outcome 4	**Perform analytics on data streams**					**K3&K6**
Unit-V						
Objective5	**To know about the database and Management**					
DELIVERING RESULTS: Documentation and deployment – producing effective presentations – Introduction to graphical analysis – plot() function – displaying multivariate data – matrix plots – multiple						
Outcome 5	**Learn NoSQL databases and management**					**K5&K6**

Suggested Readings:

Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets",
Cambridge University Press, 2014.

Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley &
Sons, Inc., 2012.

W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.

Online Resources:
https://www.simplilearn.com
https://www.azdocuments.in

K1 - Remember	**K2 - Understand**	**K3 - Apply**	**K4 - Analyze**	**K5 - Evaluate**	**K6 – Create**

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

Semester-I						
Core II	**Course Code** **7BD1C2**	**ADVANCED COMPUTING FOR BIG DATA ANALYTICS**	**T**	**C**		**H/W**
				4		**4**
Unit -I						
Objective1	To know the fundamental concepts of big data and analytics					
Introduction to Big Data: Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce						
Outcome 1	Work with big data tools and its analysis techniques .				**K1&K2**	
Unit - II						
Objective 2	To explore tools and practices for working with big data					
Introduction Hadoop: Big Data – Apache Hadoop & Hadoop Eco System – Moving Data inand out of Hadoop – Understanding inputs and outputs of Map Reduce - Data Serialization.						
Outcome 2	Analyze data by utilizing clustering and classification algorithms				**K3**	
Unit - III						
Objective 3	To learn about stream computing					
Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, Hadoop Map Reduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.						
Outcome 3	Understand and demonstrate the role of statistics in the analysis of large of datasets				**K4**	
Unit IV						
Objective 4	To know about the research that requires the integration of large amounts of data.					
Hadoop Ecosystem and Yarn: Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features- Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN						
Outcome 4	Understand and demonstrate advanced knowledge of statistical data analytics as applied to large data sets				**K3&K6**	
Unit-V						
Objective5	To know about the Hadoop					
Hive and HiveQL, Hbase: Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase concepts- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.						
Outcome 5	Select and apply suitable statistical measures and analyses techniques for data of various structure and content and present summary statistics.				**K5&K6**	

Suggested Readings:

Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley,ISBN: 9788126551071, 2015.

Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.3.Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.

Online resources:

https://www.techtarget.com

https://cloud.google.com

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	**1.8**	**1.8**	**2.4**	**2**	**2.2**	**1.6**	**2.6**	**2.4**	**2.2**	**1.8**

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	**2**	**2.6**	**2**	**2**	**1.6**

S–Strong (3), M-Medium (2), L-Low (1)

Semester-I					
Core -III	**Course Code**	**PROGRAMMING WITH PYTHON – LAB**	**P**	**C**	**H/W**
	7BD1P1			**5**	**5**

Unit -I		
Objective1	**To know the basics of Programming**	

1. Write a python program for Arithmetic Operations.

2. Factorial calculation using python.

3. Write a python program for Fibonacci sequence up to n^{th} term using recursive functions.

Outcome 1	**Develop algorithmic solutions to simple computational problems**	**K1&K2**
Unit - II		
Objective 2	**To convert an algorithm into a Python program**	

1. A. Python Program to Check Palindrome Number

   B. Python Program to Check Armstrong Number

2. A. Find the sum of natural numbers up to n using recursive function

   B. Find the prime numbers using python

3. Find the maximum of a list of numbers using Linear search

Outcome 2	**Develop and execute simple Python programs.**	**K3**
Unit - III		
Objective 3	**To construct Python programs with control structures.**	

1. Find the maximum of a list of numbers using Binary search

2. Write a python program for Bubble Sort

3. Write a python program for Insertion sort

Outcome 3	**Develop simple Python programs for solving problems.**	**K4**
Unit IV		
Objective 4	**To structure a Python Program as a set of functions**	

1. Write a python program for Selection sort

2. Write a python program for Merge sort

3. Write a python program for Matrix Operations.

Outcome 4	**Structure a Python program into functions.**	**K3&K6**
Unit-V		
Objective5	**To use Python data structures-lists, tuples, dictionaries.**	

1. Write a python program for String Operations.

2. Compute the GCD and HCF of two numbers.

3. Write a Python Program to Convert Decimal to Binary, Binary to Decimal, Octal and Hexadecimal.

Outcome 5	**Read and write data from/to files in Python Programs** .	**K5&K6**

Suggested Readings:
PYTHON PROGRAMMING -LAB MANUAL : (SOLVED PRACTICAL LAB EXERCISES) Kindle
Edition by Dr.L SANKARI (Author), S JEYA (Author)

Online Resources:
https://www.sciencedirect.com
https://www.geeksforgeeks.org

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

Semester-I						
CORE IV	**Course Code** **7BD1P2**	**PROGRAMMING WITH R - LAB**	**P**		**C** **4**	**H/W** **4**
Unit -I						
Objective1	**To Open RStudio. Identify the Console, Script, Environment, and Plots pane.**					
1. 2.	To create, access, modify and delete list components in R Programming. Find the factorial of a number.					
Outcome 1	**Show the installation of R Programming Environment**					**K1&K2**
Unit - II						
Objective 2	**To Create a 'Gap Minder' style plot.**					
1. 2.	Find Sum, Mean and Product of Vector in R Programming. To create and modify and access matrix elements in R Programming.					
Outcome 2	**Utilize and R Data types for developing programs.**					**K3**
Unit - III						
Objective 3	**To Create univariate visualizations with two different R packages.**					
1. 2.	Write an R Program to Make a Simple Calculator. To perform an Arithmetic operations using R Programming.					
Outcome 3	**Make use of different R Data Structures.**					**K4**
Unit IV						
Objective 4	**To dentify books, websites, and additional sources for further learning and help.**					
1. 2.	Write an R program for Bar Plot and Box Plot. Write an R program for Histogram, Pie Chart and Strip Chart.					
Outcome 4	**Develop programming logic using R Packages.**					**K3&K6**
Unit-V						
Objective5	**To Load a Workspace containing an R dataframe, edit the dataset, and save the Workspace.**					
1. 2.	To create an inheritance using R Programming. To create if and if…else statement in R programming					
Outcome 5	**Analyze the datasets using R programming capabilities. .**					**K5&K6**

Suggested Readings:

An Introduction to Political and Social Data Analysis Using R - by Thomas M. Holbrook.

Introduction to Econometrics with R - by Christoph Hanck, Martin Arnold, Alexander Gerber, and Martin Schmelzer

Online Resources:

https://kottesandeep.blogspot.com
https://www.scribd.com

K1 – Remember	**K2 - Understand**	**K3 - Apply**	**K4 - Analyze**	**K5 - Evaluate**	**K6 – Create**

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	**1.8**	**1.8**	**2.4**	**2**	**2.2**	**1.6**	**2.6**	**2.4**	**2.2**	**1.8**

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	**2**	**2.6**	**2**	**2**	**1.6**

S–Strong (3), M-Medium (2), L-Low (1)

Semester-I						
GENERAL	**Course Code** **7BD1G1**	**MARKETING ANALYSIS**	**T**	**C** **4**	**H/W** **4**	
Unit -I						
Objective1	**To Identify and comprehend the needs, preferences, and behaviors of the target market**					
MARKETING DATA SUMMARIZATION: Slicing and Dicing Marketing Data with PivotTables - Using Excel Charts to Summarize Marketing Data - Using Excel Functions to Summarize Marketing Data						
Outcome 1	**Identify, define and analyse problems and identify or create processes to solve them**					**K1&K2**
Unit - II						
Objective 2	**To Evaluate the strengths, weaknesses, strategies, and market positioning of competitors to identify opportunities and threats**					
FORECASTING TECHNIQUES: Simple Linear Regression and Correlation - Using Multiple Regression to Forecast Sales - Forecasting in the Presence of Special Events - Modeling Trend and Seasonality - Ratio to Moving Average Forecasting Method - Winter"s Method - Using Neural Networks to Forecast Sales.						
Outcome 2	**Identify and apply new ideas, methods and ways of thinking**					**K3**
Unit - III						
Objective 3	**To Recognize and capitalize on market trends, unmet needs, and emerging opportunities for growth**					
CUSTOMER NEEDS: Conjoint Analysis - Logistic Regression - Discrete Choice Analysis – Customer Value - Introduction to Customer value, Benefits.						
Outcome 3	**Demonstrate skills in time management**					**K4**
Unit IV						
Objective 4	**To Assess the efficiency and effectiveness of distribution channels to ensure products reach the target audience**					
MARKET SEGMENTATION: Cluster Analysis - User-Based Collaborative Filtering -Collaborative Filtering - Using Classification Trees for Segmentation						
Outcome 4	**Work effectively with others, capitalising on their different thinking, experience and skills**					**K3&K6**
Unit-V						
Objective 5	**To Assess the efficiency and effectiveness of distribution channels to ensure products reach the target audience**					
RETAILING AND MARKET RESEARCH TOOLS: Retailing - Introduction to retailing, Market Basket Analysis and Lift - Marketing Research Tools - Principal Components Analysis.						
Outcome 5	**Exercise critical judgement in creating new understanding.**					**K5&K6**
Suggested Readings: Wayne.L.Winston, "Marketing Analytics: Data driven techniques with MS-Excel", Wiley, 1stEdition, 2014.\ Stephan Sorger, "Marketing Analytics: Strategic models and metrics", Create SpaceIndependent Publishing Platform, 1st Edition, 2013.						
Online Resources: https://bookdown.org https://www.reliablesoft.net						
K1 – Remember	**K2 - Understand**	**K3 - Apply**	**K4 - Analyze**	**K5 - Evaluate**	**K6 – Create**	

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

Semester-I					
GENERAL	**Course Code** **7BD1G2**	**GENERAL – II – MATHEMATICAL LOGICS FOR ANALYTICS**	**T**	**C** 4	**H/W** 4

Unit -I	
Objective1	**To Apply logical checks to ensure data accuracy, consistency, and reliability before analysis**

Data Analytics Life Cycle: Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.

Outcome 1	**Analyze and evaluate the cyber security needs of an organization**	**K1&K2**

Unit - II	
Objective 2	**Formulate and test hypotheses using mathematical logic to validate or refute assumptions about data patterns.**

Statistics: Sampling Techniques - Data classification, Tabulation, Frequency and Graphic representation - Measures of central value - Arithmetic mean, Geometric mean, Harmonic mean, Mode, Median, Quartiles, Deciles, Percentile - Measures of variation – Range, IQR, Quartile deviation, Mean deviation, standard deviation, coefficient variance, skewness, Moments & Kurtosis.

Outcome 2	**Measure the performance and troubleshoot cyber security systems.**	**K3**

Unit - III	
Objective 3	**To understand market segmentation, targeting, mapping market structure and product design**

Probability and Hypothesis Testing: Random variable, distributions, two dimensional R.V, joint probability function, marginal density function. Random vectors - Some special probability distribution - Binomial, Poison, Geometric, uniform, exponential, normal, gamma and Erlang. Multivariate normal distribution - Sampling distribution – Estimation - point, confidence - Test of significance, 1& 2 tailed test, uses of t-distribution, F-distribution, $\chi 2$ distribution

Outcome 3	**Conduct a cyber-security risk assessment.**	**K4**

Unit IV	
Objective 4	**To understand the Parameters of a Valuable Network**

Predictive Analytics: Predictive modeling and Analyisis - Regression Analyisis, Multicollinearity, Correlation analysis, Rank correlation coefficient, Multiple correlation, Least square, Curve fitting and goodness of fit

Outcome 4	**Implement cyber security solutions.**	**K3&K6**

Unit-V	
Objective5	**To know about the Mobile Platform Virtualization**

Time Series Forecasting and Design of Experiments: Forecasting Models for Time series : MA, SES, TS with trend, season - Design of Experiments, one way classification, two way classification, ANOVA, Latin square, Factorial Design.

Outcome 5	**Identify the key cyber security vendors in the marketplace.**	**K5&K6**

Suggested Readings:

Chris Eaton, Dirk Deroos, Tom Deutsch et al., "Understanding Big Data", McGrawHIll, 2012.
S M Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Academic Foundation, 2011.

Online Resources:
https://www.worldscientific.com
https://link.springer.com

K1 - Remember	**K2 - Understand**	**K3 - Apply**	**K4 - Analyze**	**K5 - Evaluate**	**K6 – Create**

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	**1.8**	**1.8**	**2.4**	**2**	**2.2**	**1.6**	**2.6**	**2.4**	**2.2**	**1.8**

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	**2**	**2.6**	**2**	**2**	**1.6**

S–Strong (3), M-Medium (2), L-Low (1)

Semester-I						
DSE-I	**Course Code** **7SD1E1**	**PROGRAMMING CONCEPTS FOR DATA ANALYTICS**	**T**		**C** **4**	**H/W** **4**
Unit -I						
Objective1	To provide comprehensive knowledge to address fundamental marketing decision problems					
NETWORK PROGRAMMING & DISTRIBUTED OBJECTS: Connecting to a Server - Implementing Servers and Clients- Advanced Socket Programming – InetAddress - URL Connections – RMI Programming.						
Outcome 1	Understand the theory and basis of data analytics (including computing, statistics and mathematics) to be able to apply in the practice of data analytics.					**K1&K2**
Unit - II						
Objective 2	To Provide strong core training so that graduates can adapt easily to changes and new demands from industry.					
CONNECTING TO DATABASE: The Design of JDBC - Basic Concepts - Executing Queries– Prepared Statements - Result Sets – Metadata -Transactions.						
Outcome 2	Identify, locate, evaluate, collect, compile and responsibly (ethically, legally, socially, professionally, and securely) use data and associated materials from multiple sources relevant for Data Analytics					**K3**
Unit - III						
Objective 3	To Enable students to understand not only how to apply certain methods, but when and why they are appropriate.					
JAVABEANS: The Bean - Writing Process - Using Beans to Build an Application - Bean Property Types – Property Editors - Customizers.						
Outcome 3	Customize and utilize data analytics and data management software packages in order to manage and apply exploratory, descriptive and inferential data analytics techniques to complex data sets.					**K4**
Unit IV						
Objective 4	To Integrate fields within computer science, optimization, and statistics to create adept and well-rounded data scientists.					
STREAMS AND FILES: Streams – Text Input and Output – Reading and Writing Binary Data– Zip Archives – Object Streams and Serialization – Memory Mapped Files.						
Outcome 4	Appropriately define Data problems, formulate questions, develop and design an analysis plan, and interpret the results of these analyses.					**K3&K6**
Unit-V						
Objective5	To Expose students to real-world problems in the classroom and through experiential learning.					
PROGRAMMING MAP REDUCE: MapReduce program in Java – Map Reduce API –Progamming Examples- Combiner Functions - Distributed MapReduce Job.						
Outcome 5	Work with a team of students in consultation with a client to apply a full range of Data Analytics techniques drawn from computer science, mathematics and statistics to address a real-world application problem.					**K5&K6**
Suggested Readings: White, "Hadoop: The Definitive Guide", Third Edition - 2012 – O"Reilly – SBN:9789350237564. Cay S. Horstmann, Gary Cornell, "Core Java™ 2: Volume II–Advanced Features", PrenticeHall, 9th edition, ISBN: 978-0137081608. Jean Dollimore, Tim Kindberg, George Coulouris, "Distributed Systems Concepts andDesign", 4th Edition, Jun 2005, Hardback, 944 pages, ISBN: 9780321263544. Y. Daniel Liang, Introduction to Java Programming, Tenth Edition, Pearson, 2015.						

Online Resources:					
https://journalofbigdata.springeropen.com					
https://www.coursera.org					

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

Semester-I						
DSE-I	**Course Code**	**PRINCIPLES OF RDBMS & NoSQL**	**T**		**C**	**H/W**
	7SD1E2				**4**	**4**
Unit -I						
Objective1	**To Ensure the accuracy and reliability of data through the use of constraints and relationships.**					
The Relational Data Model: Concepts and terminology - Operations on data (DDL, DML), relationships and relationship types - Integrity constraints - Codd rules - SQL - Data types - Types of SQL Statements : DDL - DML - DCL - TCL - Working with SQL*Plus – DML operations on Tables - CREATE, INSERT, SELECT, DELETE and UPDATE - Modifying and removing table – ALTER TABLE and DROP TABLE – Types of Operators – Data Constraints						
Outcome 1	**Analyze and evaluate the high data integrity through the enforcement of constraints and the use of ACID properties.**					**K1&K2**
Unit - II						
Objective 2	**To Maintain a consistent and coherent view of the data, adhering to predefined rules and constraints.**					
Advanced SQL: Keys - SQL Functions – Query - Sub-query - Joins - Transaction Management and Reporting through SQL*Plus						
Outcome 2	**The structured nature of RDBMS helps maintain consistency and accuracy of data through well-defined schemas.**					**K3**
Unit - III						
Objective 3	**To Provide a standardized and powerful query language (SQL) for easy retrieval and manipulation of data.**					
Fundamentals of NoSQL: Introduction to NoSQL - Types of NoSQL databases – Uses of NoSQL - Advantages of NoSQL – Industry applications – NoSQL in Internet and social media – SQL Vs NoSQL and NewSQL.						
Outcome 3	**SQL provides a powerful and standardized language for interacting with the database.**					**K4**
Unit IV						
Objective 4	**To Ensure that transactions are processed reliably and adhere to the ACID properties.**					
MongoDB: Basics of MongoDB - Using JSON - Creating or generating a unique key - Support for dynamic queries - Storing binary data - Replication - Sharding - Updatinginformation in-place - Terms used in RDBMS and MongoDB - Data types in MongoDB -						
Outcome 4	**Normalization reduces data redundancy, leading to more efficient storage and minimizing update anomalies.**					**K3&K6**
Unit-V						
Objective5	**To Implement access control mechanisms to secure the database and restrict unauthorized access.**					
Operations on MongoDB: CRUD (Insert( ), Update( ), Save( ), Remove( ), find( )) -MongoDB-Arrays - Java Scripts - Cursors - Map Reduce Programming - Aggregations						
Outcome 5	**RDBMS has a mature and well-established ecosystem with a wide range of tools and technologies.**					**K5&K6**

Suggested Readings:

Ivan Bayross, "SQL,PL/SQL The programming language of Oracle", 3rd revised edition,BPB Publications, 2010

Kevin Loney, Bob Bryla, Oracle Database 12c: The Complete Reference, Oracle Press2013

Karl Seguin, "The Little MongoDB Book", 10gen Corporation, 2014

Online Resources:
https://www.geeksforgeeks.org
https://www.scylladb.com

K1 - Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

Semester-I						
DSE-I	**Course Code** **7SD1E3**	**MULTIVARIATE TECHNIQUES FOR DATA ANALYSIS**	**T**	**C** 4	**H/W** 4	

Unit -I	
Objective1	**To Identify underlying patterns and structures within the dataset that may not be apparent when analyzing variables individually.**

INTRODUCTION TO MULTIVARIATE ANALYSIS: Meaning of Multivariate Analysis, Measurements Scales - Metric measurement scales and Non-metric measurement scales, Classification of multivariate techniques (Dependence Techniques and Inter-dependence Techniques), Applications of Multivariate Techniques in different disciplines.

Outcome 1	**Multivariate techniques provide a deeper understanding of complex relationships between variables, allowing for more comprehensive insights**	**K1&K2**

Unit - II	
Objective 2	**To Reduce the number of variables while retaining as much information as possible, simplifying the analysis and interpretation of data.**

FACTOR ANALYSIS: Factor Analysis: Meanings, Objectives and Assumptions, Designing a factor analysis, Deriving factors and assessing overall factors, Interpreting the factors and validation of factor analysis.

Outcome 2	**Visualization methods in multivariate analysis, such as scatter plots, heatmaps, and multidimensional scaling, help represent complex relationships visually.**	**K3**

Unit - III	
Objective 3	**To Explore and quantify relationships between multiple variables to understand how they influence each other.**

CLUSTER ANALYSIS: Cluster Analysis: Objectives and Assumptions, Research design in cluster analysis, Deriving clusters and assessing overall fit (Hierarchical methods, Non Hierarchical Methods and Combinations), Interpretation of clusters and validation of profiling of the clusters.

Outcome 3	**Techniques like principal component analysis (PCA) help reduce redundant information by transforming the dataset into a set of uncorrelated variables.**	**K4**

Unit IV	
Objective 4	**Develop models that can predict the values of one or more variables based on the values of other variables in the dataset**

DISCRIMINANT ANALYSIS: Discriminant Analysis- concept, objective and applications. Procedure for conducting discriminant analysis. Stepwise discriminate analysis and Mahalanobis procedure. Logit model.

Outcome 4	**The insights gained from multivariate analysis contribute to informed decision-making in various fields, including business, healthcare, and social sciences.**	**K3&K6**

Unit-V	
Objective5	**To Identify outliers or unusual patterns in the data that may require further investigation.**

LINEAR PROGRAMMING: Linear Programming problem - Formulation, graphical method, simplex method. Integer Programming. Transportation and Assignment problem

Outcome 5	**Multivariate models can enhance prediction accuracy by considering interactions and dependencies between variables.**	**K5&K6**

Suggested Readings:

F Hair, William C Black etal , "Multivariate Data Analysis" , Pearson Education, 7th edition,2013.

T. W. Anderson , "An Introduction to Multivariate Statistical Analysis, 3rd Edition", Wiley,2003.

William r Dillon, John Wiley & sons, "Multivariate Analysis methods and applications",Wiley, 1984.

Naresh K Malhotra, Satyabhusan Dash, "Marketing Research Anapplied Orientation", Pearson,2011.

Hamdy A Taha, "Operations Research", Pearson, 2012.

S R Yaday, A K Malik, "Operations Research", Oxford, 2014.

Online Resources:
https://www.decisionanalyst.com
https://s4be.cochrane.org

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

Semester-II						
CORE V	**Course Code**	**ADVANCED BIG DATA TECHNOLOGIES**	**T**		**C**	**H/W**
	7BD2C1				**4**	**4**

Unit -I	
Objective1	**To Enable systems to scale horizontally to handle massive amounts of data.**

Introduction: Introduction to Big Data The four dimensions of Big Data: volume, velocity, variety, veracity, Drivers for Big Data, Introducing the Storage, Query Stack, Revisit useful technologies and concepts, Real-time Big Data Analytics.

Outcome 1	**Improved system performance and responsiveness as data volume grows.**	**K1&K2**

Unit - II	
Objective 2	**Process and analyze data in real-time or near-real-time for immediate insights.**

Distributed File Systems: Hadoop Distributed File System, Google File System, Data Consistency.

Outcome 2	**Quick decision-making and responsiveness to changing conditions or events.**	**K3**

Unit - III	
Objective 3	**To Integrate and consolidate data from various sources, including structured and unstructured data.**

Big Data Storage Models: Distributed Hash-table, Key-Value Storage Model (Amazon's Dynamo), Document Storage Model (Facebook's Cassandra), and Graph storage models.
Big Data Issues: Privacy, Visualization, Compliance and Security, Structured vs Unstructured Data

Outcome 3	**Comprehensive and unified view of the data for analysis.**	**K4**

Unit IV	
Objective 4	**To Distribute data processing across multiple nodes to improve performance and reduce processing time.**

Scalable Algorithms: Mining large graphs, with focus on social networks and web graphs. Centrality, similarity, al-distances sketches, community detection, link analysis, spectral techniques. Map-reduce, Pig Latin, and NoSQL, Algorithms for detecting similar items, Recommendation systems, Data stream analysis algorithms, Clustering algorithms, Detecting frequent items.

Outcome 4	**Efficient utilization of resources and faster data processing.**	**K3&K6**

Unit-V	
Objective5	**To Establish policies and procedures for data management, quality, and compliance.**

Employing Hadoop Map Reduce: Creating the components of Hadoop Map Reduce jobs - Distributing data processing across server farms –Executing Hadoop Map Reduce jobs - Monitoring the progress of job flows - The Building Blocks of Hadoop Map Reduce- Distinguishing Hadoop daemons - Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

Outcome 5	**Advanced analytics on Big Data yield actionable insights, helping organizations identify opportunities, mitigate risks, and optimize processes.**	**K5&K6**

Suggested Readings:
Christopher D. Manning, Prabhakar Raghavan, HinrichSchütze "An Introduction toInformation Retrieval"
Jimmy Lin, Chris Dyer "Data-Intensive Text Processing with Map Reduce"

Online Resources:
https://www.javatpoint.com
https://www.sciencedirect.com

K1 – Remember	**K2 - Understand**	**K3 - Apply**	**K4 - Analyze**	**K5 - Evaluate**	**K6 – Create**

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

Semester-II					
CORE VI	**Course Code 7BD2C2**	**ALGORITHMS FOR ADVANCED ANALYTICS**	**T**	**C**	**H/W**
				4	4

Unit -I	
Objective1	**To Develop a comprehensive understanding of advanced algorithms used in analytics.**

CLASSIFICATION ALGORITHMS: Issues regarding classification and prediction, Bayesian Classification, Classification by backpropagation, Classification based on concepts from association rule mining, Other Classification Methods, Classification accuracy.

Outcome 1	**Acquire knowledge about algorithms like machine learning, deep learning, clustering, and optimization.**	**K1&K2**

Unit - II		
Objective 2	**To Explore and understand the application of machine learning algorithms in various domains..**	

DECISION TREES: Introduction to Decision trees - Classification by decision tree induction – Various types of pruning methods – Comparison of pruning methods – Issues in decision trees – Decision Tree Inducers – Decision Tree extensions.

Outcome 2	**Understand the principles behind deep learning and its applications in tasks like image recognition and natural language processing**	**K3**

Unit - III		
Objective 3	**To Learn algorithms specific to time series analysis for forecasting and trend analysis.**	

TEXT ANALYTICS: Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications.

Outcome 3	**Acquire skills to analyze and model time-dependent data.**	**K4**

Unit IV		
Objective 4	**To Explore algorithms for processing and analyzing human language data.**	

SOFT COMPUTING FOR DATA ANALYTICS: Rationale, Motivations, Needs, Basics: Examples of Applications in Diverse Fields, Basic Tools of Soft Computing: Neural Networks, Fuzzy Logic Systems, and Support Vector Machines.

Outcome 4	**Understand how to extract insights from text data, including sentiment analysis and topic modeling.**	**K3&K6**

Unit-V		
Objective 5	**To Study algorithms for graph analytics, including centrality, community detection, and link prediction.**	

NEURAL NETWORKS: Single-Layer Networks: The Perceptron, The Adaptive Linear Neuron (Adaline) and the Least Mean Square Algorithm - Multilayer Perceptrons: The Error Backpropagation Algorithm – The Generalized Delta Rule, Heuristics or Practical Aspects of the Error Backpropagation Algorithm

Outcome 5	**Analyze and model relationships in complex networks.**	**K5&K6**

Suggested Readings:
Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques",Morgan Kaufmann Publishers, 3rd ed, 2010.
Lior Rokach and Oded Maimon, "Data Mining and Knowledge DiscoveryHandbook", Springer, 2nd edition, 2010.
Ronen Feldman and James Sanger, "The Text Mining Handbook: AdvancedApproaches in Analyzing Unstructured Data", Cambridge University Press, 2006.
Vojislav Kecman, "Learning and Soft Computing", MIT Press, 2010.
Jared Dean, "Big Data, Data Mining, and Machine Learning: Value Creation forBusiness Leaders and Practitioners", Wiley India Private Limited, 2014.

Online Resources:
https://www.javatpoint.com
https://www.sciencedirect.com

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

		Semester-II				
CORE VII	**Course Code 7BD2C3**	**BIG DATA SECURITY AND RISK ANALYSIS**	**T**		**C**	**H/W**
					4	**4**
		Unit -I				
Objective1	**To Develop a foundational understanding of security challenges specific to Big Data environments.**					
BIG DATA PRIVACY, ETHICS AND SECURITY: Privacy – Reidentification of Anonymous People – Why Big Data Privacy is self-regulating? – Ethics – Ownership – Ethical Guidelines – Big Data Security – Organizational Security. **SECURITY, COMPLIANCE, AUDITING, AND PROTECTION:** Steps to secure big data – Classifying Data – Protecting – Big Data Compliance – Intellectual Property Challenge – Research Questions in Cloud Security – Open Problems.						
Outcome 1	**Gain insights into the unique security considerations in large-scale data processing.**					**K1&K2**
		Unit - II				
Objective 2	**To Identify and assess potential security risks and vulnerabilities in Big Data systems.**					
HADOOP SECURITY DESIGN: Kerberos – Default Hadoop Model without security - Hadoop Kerberos Security Implementation & Configuration. **HADOOP ECOSYSTEM SECURITY:** Configuring Kerberos for Hadoop ecosystemcomponents – Pig, Hive, Oozie, Flume, HBase, Sqoop.						
Outcome 2	**Understand the risks associated with data storage, processing, and transmission.**					**K3**
		Unit - III				
Objective 3	**To Study and design security architectures for Big Data systems.**					
INTRODUCTION: Risk – Definition and Examples, Components and Factors; Understanding Risk Assessment, Risk Mitigation and Risk Management; Risk Analytics- Definition and Objectives.						
Outcome 3	**Develop expertise in creating robust security frameworks tailored to large-scale data environments.**					**K4**
		Unit IV				
Objective 4	**To Implement effective access control mechanisms for restricting data access based on user roles and privileges.**					
RISK ANALYTICS FOR BANKING DOMAIN: Introduction to Banking Sector; National and International laws; Credit Risk Analytics , Internal capital Adequacy Assessment Process related Risk Analytics , Limit Management , Risk-Adjusted Performance Management ,Fraud Risk; CaseStudies						
Outcome 4	**Ensure that only authorized users can access and manipulate sensitive data.**					**K3&K6**
		Unit-V				
Objective5	**To Implement encryption techniques to protect data at rest and in transit.**					
RISK ANALYTICS FOR HEALTHCARE DOMAIN: Introduction to Healthcare Sector;HIPAA,Four Enterprise Disciplines of Health Analytics, Health Outcome Analysis, Health Value and Cost; Customer Insights, Actuary Services, Framework for Customer Analytics; Risk Management						
Outcome 5	**Enable rapid response to security incidents, minimizing potential damage.**					**K5&K6**
Suggested Readings: Sherif Sakr, "Large Scale and Big Data: Processing and Management", CRC Press, 2014. Sudeesh Narayanan, "Securing Hadoop", Packt Publishing, 2013. Ben Spivey, Joey Echeverria, "Hadoop Security Protecting Your Big Data Problem", O"ReillyMedia, 2015. Clark Abrahams and Mingyuan Zhang, "Credit Risk Assessment: The New Lending Systemfor Borrowers, Lenders, and *Investors*", ISBN 978-0-470-46168-6 Jason Burke, "Health Analytics: Gaining the Insights to Transform Health Care", John WileySons Inc., 2013, ISBN: 978-1-118-38304-9						

Online Resources:
https://www.javatpoint.com
https://www.sciencedirect.com

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

Semester-II					
CORE VIII	**Course Code**	**DATA ANALYTICS WITH HADOOP – LAB**	**P**	**C**	**H/W**
	7BD2P1			**3**	**3**
Unit -I					
Objective1					

Objective1	**To Explore Hive and Pig, higher-level abstractions for data processing on Hadoop.**

1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster(one master and multiple slaves).

2. MapReduce application for word counting on Hadoop cluster

3. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.

4. K-means clustering using map reduce

5. Page Rank Computation

6. Mahout machine learning library to facilitate the knowledge build up in big dataanalysis.

7. Application of Recommendation Systems using Hadoop/mahout libraries

Outcome 1	**The lab provides practical skills relevant to various roles in the industry, such as data engineers, data analysts, and big data developers.**	**K1&K2**

Suggested Readings:

White, "Hadoop: The Definitive Guide", Third Edition - 2012 – O"Reilly – ISBN:9789350237564.

Cay S. Horstmann, Gary Cornell, "Core Java™ 2: Volume II–Advanced Features", PrenticeHall, 9th edition, ISBN: 978-0137081608.

Jean Dollimore, Tim Kindberg, George Coulouris, "Distributed Systems Concepts andDesign", 4th Edition, Jun 2005, Hardback, 944 pages, ISBN: 9780321263544.

Y. Daniel Liang, Introduction to Java Programming, Tenth Edition, Pearson, 2015.

Online Resources:

https://www.scribd.com

https://www.studocu.com

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

		Semester-II			
CORE IX	**Course Code** **7BD2MP**	**MINI PROJECT**		**C** **3**	**H/W** **3**
		Unit -I			
Objective1	To analyze customer data and implement a recommendation system based on customer segmentation.				

The Head of the Department / Director will assign a faculty member as the Mini-project Guide to a particular student concerned in the beginning of the second semester. The student has to fix the project theme / title by submitting a proposal. The work flow of the chosen project and other related guidelines can be had from the Mini-project Guide. During this second semester, there will be two „Reviews" conducted by the Department and the students must present themselves in person and present the mini-project progress in the form of presentation in front of the mini-project guide. At the end of the semester, the student should prepare and submit a mini-project documentation report (not less than 30 pages, A4 size). The guide will award for 75 marks based on the performance in two reviews and the qualityof the mini-project documentation report. The final mini-project viva-voce for 25 marks will be conducted by the Department with two examiners (one mini-project guide and another onedesignated by the COE) and the cumulative marks for 100 will be given by the Department tothe COE

Outcome 1	Understand different customer segments based on purchase behavior, demographics, or other features.	**K1&K2**

K1 – Remember	**K2 - Understand**	**K3 - Apply**	**K4 - Analyze**	**K5 - Evaluate**	**K6 – Create**

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	**2**	**2.6**	**2**	**2**	**1.6**

S–Strong (3), M-Medium (2), L-Low (1)

		Semester-II			
GENERAL	Course Code 7BD2G3	WEB INTELLIGENCE AND SOCIAL NETWORK ANALYSIS	T	C	H/W
				4	4

Unit -I	
Objective1	**To Develop a conceptual understanding of web intelligence, which involves the extraction of knowledge and insights from web data.**

INTRODUCTION TO INTELLIGENT WEB: Inside the search engine - Examples of intelligent web applications - Basic elements of intelligent applications - Machine learning, data mining – Searching, Reading, indexing, and searching.

LISTEN AND LOAD: Streams, Information and Language, - Statistics of Text - Analyzing Sentiment and Intent – Load - Databases and their Evolution, Big data Technology and Trends.

Outcome 1	Grasp the fundamentals of web intelligence and its applications.	K1&K2

Unit - II	
Objective 2	**To Learn techniques for web crawling and data scraping to collect data from websites.**

CLUSTERING AND CLASSIFICATION: An overview of clustering algorithms - Clustering issues in very large datasets - The need for classification - Automatic categorization of emails and spam filtering - Classification with very large datasets - Comparing multiple classifiers on the same data.

Outcome 2	Acquire skills in gathering structured and unstructured data from the web.	K3

Unit - III	
Objective 3	**To Study web analytics tools and methodologies to analyze user behavior on websites.**

SOCIAL NETWORK ANALYSIS: Overview: Social network data-Formal methods- Paths and Connectivity-Graphs to represent social relations-Working with network data- Network Datasets- Strong and weak ties - Closure, Structural Holes, and Social Capital.

Outcome 3	Gain insights into user interactions, page views, and other web metrics.	K4

Unit IV	
Objective 4	**To Study sentiment analysis techniques to understand public sentiment on social media platforms.**

SOCIAL INFLUENCE: Homophily: Mechanisms Underlying Homophily, Selection and Social Influence, Affiliation, Tracking Link Formation in OnLine Data, Spatial Model of Segregation - Positive and Negative Relationships - Structural Balance - Applications of Structural Balance, Weaker Form of Structural Balance

Outcome 4	Gain insights into how people express opinions and emotions online.	K3&K6

Unit-V	
Objective5	**To Understand methods for predicting missing or future links in social networks.**

SOCIAL NETWORK MINING: Clustering of Social Network graphs: Betweenness, Girvan newman algorithm-Discovery of communities- Cliques and Bipartite graphs-Graph partitioning methods-Matrices-Eigen values-Simrank

Outcome 5	Explore predictive modeling for evolving social connections.	K5&K6

Suggested Readings:

Gautam Shroff, "Intelligent Web - Search, Smart Algorithms, and Big Data", OxfordUniversity Press, 2013.

Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, "An Introduction toInformation Retrieval", Cambridge University Press, 2009.

Jure Leskovec,Stanford Univ.Anand Rajaraman,Milliway Labs, Jeffrey D. Ullman, "Miningof Massive Datasets", Cambridge University Press, 2 edition, 2014.

Wasserman, S., & Faust, K, "Social Network Analysis: Methods and Applications",Cambridge University Press; 1 edition, 1994.

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

Semester-II						
DSE- II	**Course Code**	**RDBMS AND NoSQL LAB**	**P**		**C**	**H/W**
	7SD2E1				**4**	**4**

Unit -I

Objective1	**To Develop a comprehensive understanding of advanced algorithms used in analytics.**

SQL
1. DDL: Table Creation and description of tables
2. DML: Data Insertion, Deletion, Updating and Selection.
3. DML: Operators (Arithmetic, Relational, Logical),
4. DML: SQL Functions (Single Row Function, Group Functions).
5. DML: Set operations
6. DML: Join operations
7. Creation of Nested queries

Outcome 1	**Acquire knowledge about algorithms like machine learning, deep learning, clustering, and optimization.**	**K1&K2**

Unit - II

Objective 2	**To Explore and understand the application of machine learning algorithms in various domains.**

NoSQL
1. Creating simple documents using mongoDB
2. Operations on Documents using mongoDB
3. Working with CURD operations in mongoDB
4. Indexing and Querying with mongoDB
5. Sharding and Replication in mongoDB

Outcome 2	**Gain hands-on experience in implementing machine learning models for classification, regression, and clustering.**	**K3**

Suggested Readings:

White, "Hadoop: The Definitive Guide", Third Edition - 2012 – O"Reilly – ISBN:9789350237564.

Cay S. Horstmann, Gary Cornell, "Core Java™ 2: Volume II–Advanced Features", PrenticeHall, 9th edition, ISBN: 978-0137081608.

Jean Dollimore, Tim Kindberg, George Coulouris, "Distributed Systems Concepts andDesign", 4th Edition, Jun 2005, Hardback, 944 pages, ISBN: 9780321263544.

Y. Daniel Liang, Introduction to Java Programming, Tenth Edition, Pearson, 2015.

Online Resources:

https://www.scribd.com

https://www.shiksha.com

K1 – Remember	**K2 - Understand**	**K3 - Apply**	**K4 - Analyze**	**K5 - Evaluate**	**K6 – Create**

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	**1.8**	**1.8**	**2.4**	**2**	**2.2**	**1.6**	**2.6**	**2.4**	**2.2**	**1.8**

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	**2**	**2.6**	**2**	**2**	**1.6**

S–Strong (3), M-Medium (2), L-Low (1)

Semester-II						
DSE- II	**Course Code** **7SD2E2**	**ADVANCED MS-EXCEL FOR DATA ANALYTICS-LAB**	**P**	**C** **4**	**H/W** **4**	
Unit -I						
Objective1	**To Develop a foundational understanding of security challenges specific to Big Data environments.**					
	1. Creating Datasets for Data Analytics using MS-Excel 2. Working with Cells, Data and built-in functions					
Outcome 1	**Gain insights into the unique security considerations in large-scale data processing.**					**K1&K2**
Unit - II						
Objective 2	**To Identify and assess potential security risks and vulnerabilities in Big Data systems.**					
	1. Structured Query Language (SQL) in MS-Excel 2. Working with Microsoft Power BI Desktop					
Outcome 2	**Understand the risks associated with data storage, processing, and transmission.**					**K3**
Unit - III						
Objective 3	**To Study and design security architectures for Big Data systems.**					
	1. Working with Power BI add-ins in MS-Excel 2. Working with Query Editor.					
Outcome 3	**Develop expertise in creating robust security frameworks tailored to large-scale data environments.**					**K4**
Unit IV						
Objective 4	**To Implement encryption techniques to protect data at rest and in transit.**					
	1. Working with PowerPivot 2. Extract, Transform, and Load data with Power Query					
Outcome 4	**Enhance the confidentiality and integrity of data by securing it against unauthorized access and tampering.**					**K3&K6**
Unit-V						
Objective5	**To Implement strong authentication mechanisms and fine-grained authorization controls.**					
	1. Creating and arranging visualizations 2. Data Visualization with Power Map					
Outcome 5	**Enable rapid response to security incidents, minimizing potential damage.**					**K5&K6**

Suggested Readings:

White, "Hadoop: The Definitive Guide", Third Edition - 2012 – O"Reilly – ISBN:9789350237564.

1. Cay S. Horstmann, Gary Cornell, "Core Java™ 2: Volume II–Advanced Features", PrenticeHall, 9th edition, ISBN: 978-0137081608.

2. Jean Dollimore, Tim Kindberg, George Coulouris, "Distributed Systems Concepts andDesign", 4th Edition, Jun 2005, Hardback, 944 pages, ISBN: 9780321263544.

Online Resources:
https://www.scribd.com
https://www.shiksha.com

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

		Semester-II			
DSE- II	**Course Code 7SD2E2**	**WEB DESIGNING TECHNOLOGIES - LAB**	**P**	**C**	**H/W**
				4	**4**

	Unit -I	
Objective1	**Familiarize participants with popular web designing tools and software.**	

    1. Simple programs using PHP
    2. Simple programs using Controls and Functions
    3. Working with functions

Outcome 1	**To gain a basic understanding of tools like Adobe Dreamweaver, Sketch, or similar software.**	**K1&K2**

	Unit - II	
Objective 2	**Introduce the fundamentals of HTML and CSS for web page structure and styling.**	

    1. Programs for working with String Functions
    2. Illustrating the working with Arrays.
    3. HTML forms and PHP

Outcome 2	**Create and style static web pages using HTML and CSS.**	**K3**

	Unit - III	
Objective 3	**Teach the principles of responsive web design using media queries and flexible grids.**	

    1. Passing Variables to PHP from HTML forms.
    2. Creating simple Database in MySQL and connectivity with PHP
    3. Display Student Information using PHP and MySQL..

Outcome 3	**Design websites that adapt to different screen sizes and devices.**	**K4**

	Unit IV	
Objective 4	**Provide an introduction to JavaScript for enhancing interactivity on web pages.**	

    1. Develop a College Application Form using PHP and MySQL
    2. File System Functions, Network Functions, Date and Time Functions.
    3. File Upload and Converting Image File Types

Outcome 4	**Understand the basics of JavaScript and can add simple interactive features.**	**K3&K6**

	Unit-V	
Objective5	**Provide an overview of frontend JavaScript frameworks for building dynamic web applications.**	

    1. Maintenance of Session.
    2. Managing Cookies.
    3. Message Passing Mechanism between Pages

Outcome 5	**Gain a basic understanding of building interactive web interfaces using frameworks.**	**K5&K6**

Suggested Readings:
    1.   HTML Black Book – Steve Holzner.
    2.   The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH
    3.   Java Server Pages –Hans Bergsten, SPD O'Reilly

Online Resources:
https://www.scribd.com
https://www.shiksha.com

K1 – Remember	**K2 - Understand**	**K3 - Apply**	**K4 - Analyze**	**K5 - Evaluate**	**K6 – Create**

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	**1.8**	**1.8**	**2.4**	**2**	**2.2**	**1.6**	**2.6**	**2.4**	**2.2**	**1.8**

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	**2**	**2.6**	**2**	**2**	**1.6**

S–Strong (3), M-Medium (2), L-Low (1)

Semester-II						
DSE– III	**Course Code 7SD2E4**	**CORPORATE ETIQUETTE SKILLS**	**T**	**C**	**H/W**	
				4	**4**	

Unit -I	
Objective1	**To Provide participants with a clear understanding of corporate etiquette principles and their importance.**

Professionalism: Professional approach & behaviour – rational vs. emotional decisions – analysis of self-competence and self confidence – qualities of an effective executive

Outcome 1	**Improved time management skills result in increased productivity and the ability to meet deadlines consistently.**	**K1&K2**

Unit - II		
Objective 2	**Enhance communication skills, including written and verbal communication, in a professional context.**	

Corporate Etiquette: Dressing occasions – formal – semi formal and informal – Eating habits– Table manners – Body language: Kinesics and proximity

Outcome 2	**A focus on appearance, dress code, and online presence contributes to a positive and polished professional image.**	**K3**

Unit - III		
Objective 3	**Educate participants on the importance of professional appearance and adherence to dress codes**	

House Keeping Skills: Cleanliness at work place – Organizing the Work Table and Shelves – Spatial Utility and Energy Saving habits – Office Files and Personal Computer / Laptop management.

Outcome 3	**Effective networking and conflict resolution skills contribute to improved collaboration among team members.**	**K4**

Unit IV		
Objective 4	**Teach effective meeting etiquette, including punctuality, active participation, and respectful behavior.**	

Front Office Skills: Reception and Greeting – Telephone manners – effective visitor appointments management – Preparation to attend office meetings – preparation to hold office meetings.

Outcome 4	**The implementation of corporate etiquette contributes to a positive and respectful workplace atmosphere.**	**K3&K6**

Unit-V		
Objective5	**To Develop networking skills for professional relationship building**	

Documentation: Objectives, Report writing, writing minutes, Preparation methods, and Report for media

Outcome 5	**Improved communication skills lead to clear, concise, and professional interactions both in writing and verbally.**	**K5&K6**

Suggested Readings:

Naveen Kumar, Sudan A. S; Managerial Skill Development, First Edition (2004),Anmol Publications
Lesikar & Flatley, Basic Business Communication, New Delhi: Tata McGraw Hill

Online Resources:
www.executiveworld.com
www.selfconfidence.co.uk
www.senselang.com

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	**1.8**	**1.8**	**2.4**	**2**	**2.2**	**1.6**	**2.6**	**2.4**	**2.2**	**1.8**

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	**2**	**2.6**	**2**	**2**	**1.6**

S–Strong (3), M-Medium (2), L-Low (1)

Semester-I					
DSE- III	Course Code 7SD2E5	DECISION MANAGEMENT SYSTEMS	T	**C** 4	**H/W** 4

Unit -I	
Objective1	To Provide participants with a comprehensive understanding of Decision Management Systems, their components, and their role in organizational decision-making.

PRINCIPLES OF DMS: Principles of Decision Management Systems - Begin with the Decisionin Mind - Be Transparent and Agile - Be Predictive, Not Reactive - Test, Learn, and Continuously Improve.

Outcome 1	Gain proficiency in designing decision models for various scenarios.	K1&K2

Unit - II	
Objective 2	Introduce decision modeling techniques, such as decision tables, decision trees, and process models, to represent and structure decision logic.

BUILDING DECISION MANAGEMENT SYSTEMS: Building Decision Management Systems - Discover and Model Decisions - Characteristics of Suitable Decisions - A Decision Taxonomy - Finding Decisions - Documenting Decisions - Prioritizing Decisions.

Outcome 2	Understand how rules engines execute decision logic and contribute to agility in decision-making.	K3

Unit - III	
Objective 3	Explore the role of rules engines in DMS and teach how to define and manage business rules effectively.

DESIGN AND IMPLEMENT DECISION SERVICES: Design and Implement Decision Services - Build Decision Services - Integrate Decision Services - Best Practices for Decision Services Construction - Monitor and Improve Decisions - What Is Decision Analysis? - Monitor Decisions - Determine the Appropriate Response - Develop New Decision-Making Approaches - Confirm the Impact Is as Expected - Deploy the Change..

Outcome 3	Learn how to refine decision models and rules for better outcomes over time.	K4

Unit IV	
Objective 4	To Highlight the integration of Decision Management Systems with data analytics for informed decision-making.

ENABLERS FOR DECISION MANAGEMENT SYSTEMS: Enablers for Decision Management Systems - People Enablers - The Three-Legged Stool - A Decision Management Center of Excellence - Organizational Change - Process Enablers - Managing a Decision Inventory - Adapting the Software Development Lifecycle - Decision Service Integration Patterns Moving to Fact-Based Decisioning - The OODA Loop - Technology Enablers.

Outcome 4	Gain the knowledge to successfully deploy DMS within their organizations.	K3&K6

Unit-V	
Objective5	To Teach optimization techniques and the importance of continuous improvement in Decision Management.

BUSINESS RULES MANAGEMENT SYSTEMS: Business Rules Management Systems - Predictive Analytics Workbenches - Optimization Systems - Pre-Configured Decision Management Systems - Data Infrastructure - A Service-Oriented Platform.

Outcome 5	Adopt a mindset of continuous improvement, regularly optimizing decision models for better outcomes.	K5&K6

Suggested Readings:

James Taylor, "Decision Management Systems-A Practical guide to using Business rules andPredictive Analytics", IBM Press, 2012.

Efraim Turban , Jay E. Aronson , Ting-Peng Liang, "Decision Support Systems & IntelligentSystems", 9th edition, Prentice Hall, 2010.

Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.

Eric Siegel, Thomas H. Davenport, "Predictive Analytics: The Power to Predict Who WillClick, Buy, Lie, or Die", Wiley, 2013.

George M Marakas, "Decision support Systems", 2nd Edition, Pearson/Prentice Hall,2002

Online Resources:

https://download.e-bookshelf.de

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	1.8	1.8	2.4	2	2.2	1.6	2.6	2.4	2.2	1.8

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	2	2.6	2	2	1.6

S–Strong (3), M-Medium (2), L-Low (1)

Semester-II						
DSE – III	Course Code 7SD3E6	INFORMATION STORAGE MANAGEMENT	T		C 4	H/W 4

	Unit -I	
Objective1	To Provide participants with a comprehensive understanding of Information Storage Management concepts, principles, and best practices.	

INTRODUCTION TO STORAGE AND MANAGEMENT: Introduction to Information Storage Management - Data Center Environment–Database Management System (DBMS) – Host Connectivity – Storage-Disk Drive Components- Intelligent Storage System -Components of anIntelligent Storage System-Storage Provisioning- Types of Intelligent Storage Systems.

Outcome 1	Understand the concepts of cloud storage and can integrate cloud solutions into their overall storage strategy.	K1&K2

	Unit - II	
Objective 2	Teach principles of data lifecycle management, covering data creation, storage, retrieval, archival, and disposal.	

STORAGE NETWORKING: Fibre Channel: Overview - SAN and Its Evolution -Components of FC SAN -FC Connectivity-FC Architecture- IPSAN-FCOE-FCIP-Network-Attached Storage- General-Purpose Servers versus NAS Devices - Benefits of NAS- File Systems and Network File Sharing-Components of NAS - NAS I/O Operation -NAS Implementations -NAS File-Sharing Protocols-Object-Based Storage Devices-Content-Addressed Storage -CAS Use Cases.

Outcome 2	Understand how to align storage practices with regulatory requirements.	K3

	Unit - III	
Objective 3	To Explore storage virtualization concepts and technologies for improving storage efficiency.	

BACKUP AND RECOVERY: Business Continuity -Information Availability -BC Terminology-BC Planning Life Cycle - Failure Analysis -Business Impact Analysis-Backup and Archive - Backup Purpose - Backup Considerations -Backup Granularity - Recovery Considerations -Backup Methods -Backup Architecture - Backup and Restore Operations.

Outcome 3	They can make informed decisions about the selection and implementation of storage technologies based on organizational needs.	K4

	Unit IV	
Objective 4	To Address data security considerations in storage management, including encryption, access controls, and compliance.	

CLOUD COMPUTING: Cloud Enabling Technologies -Characteristics of Cloud Computing - Benefits of Cloud Computing -Cloud Service Models-Cloud Deployment models-Cloud computing Infrastructure-Cloud Challenges.

Outcome 4	Implement security measures to protect stored data, considering encryption, access controls, and compliance requirements.	K3&K6

	Unit-V	
Objective5	Teach techniques for monitoring and managing storage performance to ensure optimal system operation.	

SECURING AND MANAGING STORAGE INFRASTRUCTURE: Information Security Framework - Storage Security Domains-Security Implementations in Storage Networking - Monitoring the Storage Infrastructure -Storage Infrastructure Management Activities -Storage Infrastructure Management Challenges.

Outcome 5	Design and implement data lifecycle management strategies that consider the entire data journey.	K5&K6

Suggested Readings:

EMC Corporation, Information Storage and Management, WileyIndia, 2nd Edition, 2011.

Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.

Marc Farley, Building Storage Networks, Tata McGraw Hill , Osborne,2nd Edition, 2001.

Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002.

Online Resources:

https://www.slideshare.net

K1 – Remember	K2 - Understand	K3 - Apply	K4 - Analyze	K5 - Evaluate	K6 – Create

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)	M(2)
CO2	L(1)	M(2)	S(3)	M(2)	M(2)	L(1)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	L(1)	M(2)	S(3)	S(3)	M(2)	S(3)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)
W.AV	**1.8**	**1.8**	**2.4**	**2**	**2.2**	**1.6**	**2.6**	**2.4**	**2.2**	**1.8**

S–Strong (3), M-Medium (2), L-Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	S(3)	M(2)	L(1)	M(2)
CO2	S(3)	M(2)	S(3)	M(2)	L(1)
CO3	L(1)	M(2)	M(2)	S(3)	L(1)
CO4	M(2)	S(3)	L(1)	M(2)	M(2)
CO5	M(2)	S(3)	M(2)	M(2)	M(2)
W.AV	**2**	**2.6**	**2**	**2**	**1.6**

S–Strong (3), M-Medium (2), L-Low (1)

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