PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR SALEM 636 011



MASTER OF SCIENCE IN DATA ANALYTICS SEMESTER PATTERN Under Choice Based Credit System

REGULATIONS AND SYLLABUS FOR AFFILIATED COLLEGES (Effective from the Academic year 2023 - 2024 onwards)

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PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR SALEM 638 011

Regulations Effective from the Academic year 2023 - 2024

i) OBJECTIVE OF THE COURSE

To Develop the Post Graduate in Data Analytics with strong knowledge of theoretical computer science and who can be employed in research and development units of industries and academic institutions.

ii) CONDITION FOR ADMISSION

A candidate who has passed in B.Sc Computer Science / B.C.A / B.Sc Computer Technology / B.Sc Information Science / B.Sc Information Technology / B.Sc Data Analytics / B.Sc Data Science / B.Sc Artificial Intelligence and Data Science / B.Sc Cyber Security / B.Sc Internet of Things degree of this University or any of the degree of any other University accepted by the syndicate as equivalent thereto subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the M. Sc Data Analytics degree examination of this University after a course of study of two academic years.

iii) DURATION OF THE COURSE

The programme for the degree of Master of Science in Data Analytics shall consist of two Academic years divided into four semesters.

iv) EXAMINATIONS

The examination shall be of three hours duration for each course at the end of each semester. The candidate failing in any subject(s) will be permitted to appear in the subsequent examination.

The practical / project should be an individual work. The University examination for practical / project work will be conducted by the internal and external examiners jointly at the end of each semester.

v) PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES DESCRIPTION

Programme	M.Sc., Data Analytics				
Programme Code	PGCS-DA				
Duration	PG - Two Years				
Programme	PO1: Problem Solving Skill				
Outcomes (Pos)	Apply knowledge of Management theories and Human Resource				
	practices to solve business problems through research in Global				
	context.				
	PO2: Decision Making Skill				
	Foster analytical and critical thinking abilities for data-based				
	decision-making.				
	PO3: Ethical Value				
	Ability to incorporate quality, ethical and legal value-based				
	perspectives to all organizational activities.				
	PO4: Communication Skill Ability to develop communication monogonial and intermore and skills				
	Ability to develop communication, manageriar and interpersonal skins.				
	PO5: Individual and Team Leadershin Skill				
	Canability to lead themselves and the team to achieve organizational				
	goals.				
	PO6: Employability Skill				
	Inculcate contemporary business practices to enhance employability				
	skills in the competitive environment.				
	I				
	PO7: Entrepreneurial Skill				
	Equip with skills and competencies to become an entrepreneur.				
	PO8: Contribution to Society				
	Succeed in career endeavors and contribute significantly to society.				
	PO9 Multicultural competence				
	Possess knowledge of the values and beliefs of multiple cultures and				
	a global perspective.				
	PO10. Morel and othical awarenegg/reaganing				
	Ability to embrace moral/ethical values in conducting one's life				
Programme	PSO1 – Placement				
Specific Outcomes	To prepare the students who will demonstrate respectful engagement				
(PSOs)	with others' ideas behaviors beliefs and apply diverse frames of				
	reference to decisions and actions.				
	PSO2 - Entrepreneur				
	To create effective entrepreneurs by enhancing their critical thinking,				

problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.
PSO3 – Research and Development Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.
PSO4 – Contribution to Business World To produce employable, ethical and innovative professionals to sustain in the dynamic business world.
PSO 5 – Contribution to the Society To contribute to the development of the society by collaborating with stakeholders for mutual benefit.

vi) METHODS OF EVALUATION & METHODS OF ASSESSMENT

METHODS OF EVALUATION		
Internal Continuous Internal Assessment Test – 10 Marks		
EvaluationAssignments / Snap Test / Quiz – 5 Marks25 Marks	rks	
Seminars – 5 Marks		
Attendance and Class Participation – 5 Marks		
ExternalEnd Semester Examination75 Mar	rks	
Evaluation		
Total 100 Ma	arks	
METHODS OF ASSESSMENT		
Remembering • The lowest level of questions requires stude	nts to recall	
(K1) information from the course content		
Knowledge questions usually require students	to identify	
information in the text book.		
Understanding Understanding of facts and ideas by comprehending organi		
(K2) comparing, translating, interpolating and interpre-	eting in their	
own words.		
• The questions go beyond simple recall and require students to		
combine data together	•	
• Students have to solve problems by using / apply	ing a concept	
(KS) learned in the class room.	•	
• Students must use their knowledge to determ	nine a exact	
A polyzo (K4)		
• Analyzing the question is one that asks the stud	lents to break	
down something into its component parts.		
 Analyzing requires students to identify reasons cat and reach conclusions or generalizations 	ise of motives	
Evaluate (K5) Evaluation requires an individual to make	judgmont on	
Evaluate (ISS) • Evaluation requires an individual to make something	judgment on	
Someuning.		
work of art, or a solution to a problem	i, a character, a	
 Students are engaged in decision-making and problem. 	lem — solving	
 Fvaluation questions do not have single right answ. 	ers	
Create (K6) • The questions of this category challenge students t	o get engaged	

	in creative and original thinking.
•	Developing original ideas and problem-solving skills

vii)PROGRAMME OUTCOMES (PO) - PROGRAMME SPECIFIC OUTCOMES (PSO) MAPPING

PROGRAMME SPECIFIC OUTCOMES (PSO)					
	PO1	PO2	PO3	PO4	PO5
PSO1	3	3	3	3	3
PSO2	3	3	3	3	3
PSO3	3	3	3	3	3
PSO4	3	3	3	3	3
PSO5	3	3	3	3	3

Level of Correlation between PO's and PSO's

(Suggested by UGC as per Six Sigma Tool – Cause and Effect Matrix)

Assign the value

- 1 Low
- 2 Medium

3 – High

0 – No Correlation

Course	ourse Title of the Course		Hours		Maximum Marks		
Code	The of the Course	Creatts	Theory	Practical	CIA	ESE	Total
]	FIRST SH	EMESTEF	Ł			
23PDA01	Core 1: Descriptive Statistics	4	5	-	25	75	100
23PDA02	Core 2: Foundations of Data Science	4	5	-	25	75	100
23PDA03	Core 3: Linear Algebra	3	4	-	25	75	100
23PDAE_	Elective I	3	4	-	25	75	100
23PDAE_	Elective II	2	4	-	25	75	100
23PDAP01	Lab1: Oracle and SQL Lab	3	-	4	40	60	100
23PDAP02	Lab2: Data Analytics Lab I (R, SPSS, SciLab)	3	-	4	40	60	100
	Total	22	22	8			
	SI	ECOND S	SEMESTE	CR .			
23PDA04	Core 4: Probability and Distributions	4	4	-	25	75	100
23PDA05	Core 5: Machine Learning	4	4	-	25	75	100
23PDA06	Core 6: Big data Framework	3	4	-	25	75	100
23PDAE_	Elective III	3	4	-	25	75	100
23PDAE_	Elective IV	2	4	-	25	75	100
23PDAP03	Lab 3: Data Analytics Lab II (Hadoop, MapReduce & R,SPSS)	3	-	3	40	60	100
23PDAP04	Lab 4: Machine learning and Python Lab	3	-	4	40	60	100
23PHR01	Fundamentals of Human Rights	2	3		25	75	100
Total 24 23 7							
							1

viii) STRUCTURE OF M. Sc (DATA ANALYTICS) PROGRAMME

	TI	HIRD SE	MESTEI	R			
23PDA07	Core 7: Big Data with Spark and Hive	4	4	-	25	75	100
23PDA08	Core 8: Applied Statistics	4	4	-	25	75	100
23PDA09	Core 9: Data mining	4	4	-	25	75	100
23PDA10	Core 10: Research Methodology	3	4	-	25	75	50
23PDAE_	Elective V	2	4	-	25	75	50
23PDAP05	Lab 5: Data analytics Lab III (Spark, Hive)	3	-	5	40	60	100
23PDAP06	Lab 6: Data mining and Visualization Lab	3	-	5	40	60	100
23PDASP_	NME/Skill Enhancement Course(SEC)	2		3	40	60	100
23PDAIT1	Internship/Industrial Activity	2	-				
	Total	27	24	10			
	FO	URTH S	EMESTE	CR			-
23PDA11	Core 11: Cloud Computing	4	6		25	75	100
23PDA12	Core 12: Cyber security	4	6		25	75	100
23PDAPR1	Project Work and Viva- Voce	7	10	-	20	80	100
23PDAE_	Elective VI	2	5	-	25	75	100
23PDASP_	Skill Enhancement Course – III/Professional Competency Skill	2		3	40	60	100
23PDAEX01	Extension Activity	1	-	-			
	Total	20	12	3			
	Grand Total 93						

ix)ELECTIVES LIST

Elective Course–I (Any One)

23PDAE01	Data Structures
23PDAE02	Information Retrieval

Elective Course–II (Any One)

23PDAE03	RDBMS and SQL
23PDAE04	Information Security

Elective Course–III (Any One)

23PDAE05	Data Science with Python
23PDAE06	Web Data Analytics

Elective Course–IV (Any One)

23PDAE07	Social Media Analytics
23PDAE08	Customer Analytics

Elective Course–V

(Any One)

23PDAE09 Business Analytics 23PDAE10 Marketing Analytics

Elective Course–VI (Any One)

23PDAE11	IOT Analytics
23PDAE12	Artificial Intelligence and Analytics

SKILL ENHANCEMENT COURSES LIST (SEC)

23PDASP01 Cloud Computing – Lab

23PDASP02 Digital Image Processing Lab using MATLAB

PROFESSIONAL COMPETENCY SKILL ENHANCEMENT COURSE LIST (ANY ONE)

23PDSPC01 Soft Skill Development Lab

23PDSPC02 Data Visualization Lab

x) EDC-EXTRA DISCIPLINARY COURSE LIST

Students are expected to opt EDC (Non major elective) offered to other departments.

xi)EXTERNAL ASSESSMENT QUESTION PAPER PATTERN (THEORY)

Time: 3 Hours

Max. Marks: 75

PART- A: 15x1 = 15 marks

Answer all the questions Three questions from each unit (Multiple Choice Questions)

PART- B: 2x5 = 10 marks

Answer any TWO questions One question from each unit

PART- C: 5x10 = 50 marks

Answer all the questions One question from each unit (either or type)

The Passing minimum shall be 50% out of 75 marks (38 marks)

xii)CONTINUOUS INTERNAL ASSESSMENT FOR PRACTICAL

Test1	:	15 Marks
Test2	:	15 Marks
Record	1:	10 Marks
Total	:	40 Marks

(Record Note must be compulsorily submitted while attending the Practical Examination and No passing minimum)

xiii)EXTERNAL ASSESMENT QUESTION PAPER PATTERN (PRACTICAL)

Exam duration: 3 Hours

Max. Marks:60

There will be two questions with or without subsections to be given for the practical examination. Every question should be chosen from the question bank prepared by the examiner(s).

Distribution of Marks

Each question	: 30 Marks
Problem Understanding	: 05 Marks
Program writing	: 10 Marks
Debugging	: 10 Marks
For Correct Results	: 05 Marks

xiv)ASSESSMENT OF PROJECT WORK

Continuous Internal Assessment	: 50 Marks
Review I	: 25 Marks
Review II	: 25 Marks
External Assessment:	
Evaluation & Viva-Voce (Jointly)	: 150Marks

Common instruction for the project work

- The Candidate should submit the filled in format as given in Annexure-I to the department for approval during the 1st Week of IV Semester.
- Periodically the project should be reviewed.
- The Student should submit three copies of their Project work.
- A Sample format is enclosed in Annexure-II.
- Format of the Title page and Certificate are enclosed in Annexure-III.
- The students may use power point presentation during their viva voce examination.

xv)PASSING MINIMUM

The candidate shall be declared to have passed in the Theory / Practical / Project Work examination, if the candidate secures not less than 50% marks in EA and also in total of the prescribed marks. However submission of a record note book is a must.

xvi)CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who obtain 75% and above in the aggregate shall be deemed to have passed the examination in **First Class with Distinction** provided they pass all the examinations prescribed for the programme at the first appearance. Candidates, other than the above, who secure not less than 60% of the aggregate marks in the whole examinations, shall be declared to have passed the examination in **First Class**. The remaining successful candidates shall be declared to have passed in **Second Class**.

Candidates who pass all the examinations prescribed for the programme in first instance and within a period of two academic years from the year of admission are only eligible for **University Ranking.**

xvii)MAXIMUM DURATION FOR THE COMPLETION OF THE PROGRAMME

The maximum duration to complete the programme shall be three academic years after normal completion of the programme.

xviii)COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2023-24, that is, for students who are admitted to the first year of the programme during the academic year 2023-24 and thereafter.

PERIYAR UNIVERSITY

Name of the College	:	
Programme	:	
Name of the Student	:	
Register Number	:	
Title of the Project Work	:	
Address of Organization / Institu	tion :	
Name of the External Guide	:	
Designation	:	
Place :		
Date:		Signature of External Guide
		(With seal)
Name of the Internal Guide	:	
Qualification	:	
Teaching Experience	:	
Place :		
Date:		Signature of Internal Guide

ANNEXURE II

CONTENTS

Chapter

Page No

COLLEGE BONAFIDE CERTIFICATE COMPANY ATTENDANCE CERTIFICATEACKNOWLEDGEMENT SYNOPSIS

- 1. INTRODUCTION ORGANIZATION PROFILE SYSTEM SPECIFICATION HARDWARE CONFIGURATION SOFTWARE SPECIFICATION
- 2. SYSTEM STUDY

EXISTING SYSTEM

DESCRIPTION

DRAWBACKS PROPOSED SYSTEM

DESCRIPTION

FEATURES

3. SYSTEM DESIGN AND DEVELOPMENT

FILE DESIGN INPUT DESIGN

OUTPUT DESIGN

CODE DESIGN

DATABASE DESIGN SYSTEM DEVELOPMENT

DESCRIPTION OF MODULES

(Detailed explanation about the project work)

4. SYSTEM DESIGN AND DEVELOPMENT CONCLUSION BIBLIOGRAPHY

APPENDICES

A. DATA FLOW DIAGRAM

B. TABLE STRUCTURE

C. SAMPLE CODING

- D. SAMPLE INPUT
- E. SAMPLE OUTPUT

ANNEXURE III

A. Format of the title page

TITLE OF THE PROJECT WORK

A Project work submitted in partial fulfilment of the requirements for the degree of

Master of Science in Data Analytics

To the

Periyar University, Salem - 11

By

NAME OF THE STUDENT REG. NO.



COLLEGE NAME (AFFILIATED TO PERIYAR UNIVERSITY)

Place with Pin Code

 $\mathbf{MONTH}-\mathbf{YEAR}$

B. Format of the Certificate

Name and Address of the Internal Guide

Place

Date

CERTIFICATE

Head of the Department

Internal Guide

Date of Viva-Voce:

Internal Examiner

External Examiner

SEMESTER I

23DD A 01	DESCRIPTIVE STATISTICS	Category	L	Т	Р	Credit
231 DA01	DESCRIPTIVE STATISTICS	Theory	56	4	-	4

Preamble

The course introduces the measures of central tendency and dispersion. It also provides the students with systematic knowledge in correlation, regression and outlier analysis.

Course Outcomes

Upon the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate the basic concepts of statistics	K2
CO2	Apply the concepts of correlation, regression	K3
CO3	Identify the methods for different measures of central tendency, dispersion	K4
CO4	Evaluate the methods for representation of data.	K5
CO5	Construct various plots, outliers for regression diagnostics	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1	S	М	S	S
CO2	S	S	S	М
CO3	S	S	М	S
CO4	М	S	S	S
CO5	S	S	М	S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I

Introduction: Nature and scope of Statistics, limitations of statistics - Types of data: Concept of population and sample, primary and secondary data, quantitative and qualitative data, discrete and continuous data, cross-sectional and time series data. Scales of measurement: Nominal, Ordinal, Ratio and Interval.

UNIT II

Presentation of data: Construction of Tables with one or more factors of classification, Diagrammatic representations: - Line diagram, bar diagram, pie diagram and sub-divided bar diagram, Frequency

(12 hours)

(11 hours)

distribution and cumulative frequency distribution and their graphical representations, Frequency polygon, histogram, ogive, frequency curves, stem and leaf displays.

UNIT-III

Univariate data: Different measures of location, dispersion, relative dispersion, skewness and kurtosis, Moments, Quantiles and measures based on them - comparison with moment Measures -Box-plot and detection of outliers. Trimmed mean and Winsorised mean – Simple problems.

UNIT IV

Bivariate data - scatter diagram, correlation coefficient and its properties, Correlation ratio, Intraclass correlation, Rank correlation - Spearman's and Kendall's measures

UNIT V

Regression : Introduction – Uses of regression analysis – regression lines – regression equations of X on Y and Y on X - regression equation in terms of correlation table - standard error of estimate-Use Cases

Text Book

- 1. Statistical Methods, S.P.Gupta, Sultan Chand and sons(Unit I: Chapter 1, 3, 5 (up to pgno.108) Unit II: Chapter 5 (108-126), Chapter 6 Unit V: Chapter 11)
- 2. Basic Statistics, R.Wilcox, Oxford University Press, 2009 (Unit III: 2.2-2.5,5.5,7.3,9.3)
- Fundamentals of Statistics: Volume I, Goon A.M, Gupta M.K., Dasgupta B, World press, 3. 1998(Unit IV: Chapter 10:10.1 – 10.6, Chapter 12: 12.1 – 12.5)

Reference Books

- 1. Murray R Spiegel and Larry J Stephens: Statistics, Schaum's Outline, Fourth edition, 2008
- 2. R.S.N. Pillai, Statistics, S. Chand Publishing Company Pvt Ltd, 1992
- 3. https://www.indiabix.com/data-interpretation/questions-and-answers/
- 4. https://www.mathsisfun.com/data/pictographs.html

Pedagogy

Lectures, Simulation exercises, Demonstration

(11 hours)

(11 hours)

(11 hours)

23PDA02	FOUNDATIONS OF DATA SCIENCE	Category	L	Т	Р	Credit
		Theory	56	4	-	4

Preamble

This course provides the fundamental concepts in data science. It includes Data Classification, Sources of Data, Data Science user- roles and skills, Process of big data technology, Security and Intelligence, Basics of R and statistical measures.

Prerequisite

Mathematics / Statistics and Java

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand data classification, process of big data technology, user roles and skills in data science.	K2
CO2.	Apply the fundamental concepts and techniques of data science in 360 view of Customer	K3
CO3.	Analyze the methodologies of data science	K4
CO4.	Detect myths in big data	K5
CO5.	Design the code for the problems related to data science using R	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	М	М	М
CO2.	S	S	М	М
CO3.	S	S	S	S
CO4.	S	S	S	S
CO5.	S	S	S	S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I

(11 Hours)

Data Evolution: Data Development Time Line - ICT Advancement - a Perspective –Data Growth - a Perspective - IT Components - Business Process – Landscape - Data to Data Science -**Understanding data**: Introduction - Types of Data: Numeric - Categorical – Graphical - High Dimensional Data - Data Classification - Sources of Data: Time Series - Transactional Data -Biological Data - Spatial Data - Social Network Data- Data Evolution - Data Sources.

UNIT II

(12 Hours)

Data Science: Data Science - A Discipline –Data Science vs Statistics, Data Science vs Mathematics, Data Science vs Programming Language, Data Science vs Database, Data Science vs

Machine Learning. Data Analytics- Relation: Data Science, Analytics and Big Data Analytics. Data Science Components – Big data technology – Data Science user- roles and skills- Data Science use cases

UNIT III

Digital Data-an Imprint: Evolution of Big Data –What is Big Data –Sources of Big Data. Characteristics of Big Data 6Vs –Big Data Myths –Data Discovery-Traditional Approach, Big data Technology: Big Data Technology Process –Big Data Exploration -Data Augmentation –Operational Analysis –360 View of Customers –Security and Intelligence

UNIT IV

R Basics: Introduction- Packages and Library – Data types – Basic operators – R objects- Vectors – Lists- Arrays – Matrix- Factors – Data frame- R file formats- Importing and exporting files – Data Visualization in R: Lattice package- Box plot- bar chart – scatter plot- GGplot2

UNIT V

Use cases: Insurance policy offers, Discount targeting in online shopping

Text Book

- 1. V. Bhuvaneswari, T. Devi, (2016). Big Data Analytics: A Practitioner's Approach, Bharathiar University
- 2. V. Bhuvaneswari (2016). Data Analytics with R, Bharathiar University.

Reference Books

- 1. Nina Zumal, John Mount (2014). Practical Data science in R, Managing Publication Company
- 2. Bernard Kolman, Robert C. Busby and Sharon Ross (2004). Discrete Mathematical Structures, New Delhi: Prentice Hall

Pedagogy: Lectures, Demonstration and Case Studies

(11 Hours)

(11 Hours)

(11 Hours)

Preamble

The course introduces the principles underlying linear equations and vector spaces. It also provides the concepts of Eigen values, Eigen vectors and Positive Definite Matrices

Course Outcomes

Upon the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate competence with the basic ideas of linear Algebra including the concepts of vector spaces, Determinants, Eigen values and Eigenvectors and positive definite matrices	K2
CO2	The ability to understand the principles of Linear Algebra	K3
CO3	Apply properties of linear spaces to specific mathematical structures	K4
CO4	Compose clear and accurate proofs using the concepts of linear Algebra	K5
CO5	Appreciate the significance of vector spaces and positive definite Matrices	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	М
CO3	S	S	S	S
CO4	S	S	М	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

(11 Hours)

The Geometry of Linear Equations- An Example of Gaussian Elimination- Matrix Notation and Matrix Multiplication - Triangular Factors and Row Exchanges- Inverses and Transposes

UNIT II

Vector Spaces: Vector Spaces and Subspaces – Solving Ax=0 and Ax=b - Linear Independence, Basis, and Dimension- The Four Fundamental Subspaces- Graphs and Networks- Linear Transformations

UNIT III

Determinants: Introduction- Properties of the Determinant- Formulas for the Determinant-Applications of Determinants

UNIT IV

(11 Hours)

(11 Hours)

Eigenvalues and Eigenvectors: Introduction- Diagonalization of a Matrix .- Difference Equations and Powers A ^k- Differential Equations and e ^{At} - Complex Matrices- Similarity Transformations

(11 Hours)

21

UNIT V

Positive Definite Matrices: Minima, Maxima, and Saddle Points - Tests for Positive Definiteness-Singular Value Decomposition

Text Book

Gilbert Strang(2006). Linear Algebra and Its Application, Fourth Edition, Academic Press.

Reference Books

- 1. David C. Lay, Steven R. Lay, Judi J. McDonald (2014). Linear Algebra and Its Applications, Pearson Education.
- 2. Peter D. Lax(2007). Linear Algebra and Its Applications, Second Edition, Wiley Publication

Pedagogy: Lectures, Demonstration and Case Studies

Category	L	Т	Р	Credit
Practical	-	-	75	3

Preamble

This course provides sound introduction to implement the relational database management systems concepts in SQL. This course also provides various exercises to implement the integrity constraints on databases, functions, procedures, cursors, triggers, exception handling, forms and reports.

Prerequisite

- Database concepts
- Programming concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO6.	Implement the databases concepts and SQL queries as per implementation.	K2
CO7.	Apply specific SQL commands on relational tables for different situations	К3
CO8.	Analyse use cases and create constraints suitable for the given situation.	K4
CO9.	Create and analyse a database using SQL DML/DDL commands	K6
CO10.	Design and build a GUI application	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO6.	S	S	S	S
CO7.	S	S	S	S
CO8.	S	S	S	S
CO9.	S	S	S	S
CO10.	S	S	S	S

S-Strong; M-Medium; L-Low

Syllabus

- Exercises to implement the concepts of null constraint, unique constraint, integrity constraints, check constraints.
- Exercises to implement nested queries.
- Exercises to implement the concepts of partitioning queries
- Exercises to create a view from the tables
- Exercises to create functions and procedures
- Exercise to create triggers and queries
- Exercise to create forms and reports.
- Exercises to create cursors and exceptions
- Exercises to create Simple applications

Credit

3

Preamble

The course deals with the implementation of linear algebra concepts in Scilab. This course also provides various exercises to implement the statistical functions using R and SPSS.

Prerequisite

- Statistical concepts
- Basic concepts of algebra

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of Linear algebra and statistics	K2
CO2	Implement the algebraic and statistical problems using Scilab and R	К3
CO3	Apply the concepts of Linear algebra and statistics in real time problems	K4
CO4	Analyse real time data using various statistical measures in scilab	K5
CO5	Construct models using various statistical methods in R and SPSS	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO11.	S	S	S	S
CO12.	S	S	S	S
CO13.	S	S	S	S
CO14.	S	S	S	S
CO15.	S	S	S	S

S-Strong; M-Medium; L-Low

Syllabus

- Exercises to implement the basic matrix operations in Scilab.
- Exercises to find the Eigenvalues and eigenvectors in Scilab.
- Exercises to solve equations by Gauss elimination, Gauss Jordan Method and Gauss Siedel in Scilab.
- Exercises to implement the associative, commutative and distributive property in a matrix in Scilab.
- Exercises to find the reduced row echelon form of a matrix in Scilab.
- Exercises to plot the functions and to find its first and second derivatives in Scilab.
- Exercises to present the data as a frequency table in SPSS.
- Exercises to find the outliers in a dataset in SPSS.
- Exercises to find the most risky project out of two mutually exclusive projects in SPSS

- Exercises to draw a scatter diagram, residual plots, outliers leverage and influential data points in R
- Exercises to calculate correlation using R
- Exercises to implement Time series Analysis using R.
- Exercises to implement linear regression using R.

SEMESTER II

23PDA04	PROBABILITY AND DISTRIBUTIONS	Category	L	Т	Р	Credit
		Theory	56	4	-	4

Preamble

This course introduces the fundamental concepts of probability and random variables .It also provides knowledge in discrete and continuous distributions. It deals with various sampling distributions like t, F, chi-square distributions etc.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of probability and its distributions.	K2
CO2	Demonstrate skills in handling problems involving random variables and their functions	K2
CO3	Apply sampling distributions to contribute to the process of making rational decisions in analytical problems.	К3
CO4	Analyse the various sampling tests and choose test suitable for the problem	K4
CO5	Formulate the hypothesis test for various complex problems	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	М	М	М
CO2	S	S	М	М
CO3	S	S	S	М
CO4	S	М	S	М
CO5	S	S	S	М

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

Random Experiment: Sample space, Different types of events. Approaches of measuring probability: Mathematical, Statistical and Axiomatic probability, Laws of probability-conditional probability – Baye's theorem

Unit II

(11 Hours)

(11 Hours)

Random variable - Discrete and Continuous Random variables - Distribution function and its properties – Expectation and Moment Generating function: Raw and Central moments-relationship between central and raw moments-moments about an arbitrary value-moment generating function-properties of moment generating moment-characteristic function- simple problems.

Unit III

Discrete Distributions: Binomial, Poisson, Geometric distributions and their properties. Continuous Distributions: Rectangular, Exponential, Normal, lognormal distributions and their properties-Simple problems

Unit IV

Central limit theorem - Confidence interval for one mean and difference of two means. Testing of Hypotheses : Introduction –relation between confidence interval and testing of hypothesislevel of significance and p-value. Classification of hypothesis tests-Large sample tests: Single mean, Difference of two means, Single proportion, Difference of two proportions

Unit V

Small sample tests:t-test for single mean,difference between two means-F-test for equality of two population variances-Chi-square test for single mean, Chi-square test for goodness of fit- Chi-square test for independence of attributes and homogeneity and equality of proportions. Applications to machine learning

Text Books

Ravichandran. J , Probability and Statistics for Engineers, Wiley, 2015. Unit I: Section: 1.1-1.4 Unit II: Section: 2.1-2.5, 3.1-3.2, 3.3.1 - 3.3.6 Unit III: Section: 4.1,4.2.1-4.2.4,5.1-5.3,5.5 Unit IV: Section: 6.4, 10.3.1, 10.3.2, 11.1-11.4 Unit V : Section – 11.5.1-11.5.7

Reference Books

.Goon A.M., Gupta M.K. & Dasgupta B, An Outline of Statistical Theory (Vol-1), World Press, 1994.

- Rohatgi V.K., An Introduction to Probability Theory and Mathematical Statistics, John Wiley, 1984
 Scymour Lipschutz Probability Schaum's Outline 1996
- 2. Scymour Lipschuts, Probability, Schaum's Outline, 1996.
- 3. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and sons, 2002

Pedagogy : Lectures, Case studies, Demonstrations

(11 Hours)

(11 Hours)

(12 Hours)

23PDA05	MACHINE LEARNING	Category	L	Т	Р	Credit
		Theory	56	4	-	4

Preamble

This course introduces the fundamentals of Machine Learning and algorithms. It also covers various supervised and unsupervised learning algorithms used for classification, prediction and clustering.

Prerequisite

- Statistics and probability
- Linear Algebra

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of machine learning.	K2
CO2	Apply supervised and unsupervised learning algorithms for classification, prediction and clustering.	K3
CO3	Analyze the logic behind the execution of various classifiers.	K4
CO4	Evaluate the performance of different algorithms available for mining data.	K5
CO5	Predict solution for real world problems.	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	Μ	М	М
CO2	S	М	М	М
CO3	S	S	S	М
CO4	S	S	S	М
CO5	S	S	S	М

S-Strong; M-Medium; L-Low

Syllabus

UNIT I

Introduction: Machine learning – Examples and Applications - Perspectives and Issues in Machine learning - Input: Concepts, Instances, and Attributes - Output: Knowledge Representation-Credibility: Evaluating What's Been Learned: Training and Testing - Predicting Performance - Cross Validation - Other Estimates - Counting the cost.

UNIT II

Decision Tree Learning: Decision tree representation – Decision tree learning – Random forest -Issues in decision tree learning- Bayesian Learning: Naïve Bayes classifier - Instance Based Learning: Introduction – k- nearest neighbor Learning - Radial Basis Function, Case based reasoning.

(11 Hours)

(11 Hours)

UNIT III

Artificial Neural Network - Introduction – Neural Network Representation - Perceptrons - Multilayer Networks and Backpropagation Algorithm - Linear models for Regression- Linear Discriminant Analysis - PCA – Kernel PCA

UNIT IV

SVM: Introduction-Kernel methods - formulation and computation-SVM Linear classifier-SVM with two variables -non-linear classifier-Polynomial kernels- Radial Basis Function Kernels - Clustering Methods.- Introduction - K- Means- Expectation-Maximization Algorithm- Hierarchical Clustering - Choosing the Number of Clusters

UNIT V

Deep Learning – Deep feed forward network – Convolutional neural network – Autoencoders –Deep Belief Networks -Recurrent Neural Network - Use Cases: Finding similar users in Twitter (Mahout), Email marketing system (Mahout)

Reference Books

- 1. Ian Witten, Data mining: Practical Machine Learning Tools and Techniques, Fourth edition, Morgan Kaufmann Publishers
- 2. Tom M. Mitchell (1997). Machine Learning, Tata McGraw-Hill, New Delhi
- 3. K.P. Soman, Machine Learning with SVM and Other Kernel Methods, 2011, PHI Publishing

Pedagogy : Lectures, Group Discussions, Demonstrations.

(11 Hours)

(11 Hours)

(12 Hours)

30

23PDA06

Credits

4

Preamble

This course introduces big data framework, technologies, storage and Hadoop ecosystem. It also deals with the concepts of MapReduce, Pig and Scala programming.

Prerequisite

- Database Management systems
- Programming concepts

Course Outcomes

On successful completion of the course, students will be able to

CO		Knowledge
Number	CO Statement	Level
CO1	Understand the characteristics of big data,concepts of Hadoop ecosystem and scala programming.	K2
CO2	Apply Mapreduce programming model to process big data.	K2
CO3	Analyze Spark applications for its use in big data processing.	K3
CO4	Evaluate techniques used for handling NoSQL databases MongoDB and Hbase.	K4
CO5	Design programs for big data applications using Hadoop components.	K6

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	S	S	М
CO2	S	S	S	М
CO3	S	S	S	М
CO4	S	S	S	М
CO5	S	S	S	М

Syllabus

UNIT I

(11 Hours)

(11 Hours)

Introduction to Big data: Introduction - Big Data- Characteristics of Big Data - Big data management architecture- Examining Big Data Types - Big Data Technology Components -- Big data analytics -Big data analytics examples - Web Data Overview - Web Data in Action.

UNIT II

Hadoop : Introduction - History of Hadoop - Hadoop Ecosystem- Analyzing data with Hadoop -Hadoop Distributed File System- Design - HDFS concepts - Hadoop filesystem - Data flow - Hadoop I / O - Data integrity - Serialization - Setting up a Hadoop cluster - Cluster specification - cluster setup and installation - YARN

UNIT III

MapReduce: Introduction - Understanding Map, Reduce functions - Scaling out - Anatomy of a MapReduce Job Run - Failures - Shuffle and sort - Mapreduce types and formats - features - counters - sorting - Unit test with MR unit- local test

UNIT IV

Data Analytics using Pig: Introduction – Downloading and installing pig - Grunt – Pig's Data model - Types - Schemas. Introduction to Pig Latin - Preliminary matters - Input and Output - Relational operators - Developing and Testing Pig Latin Scripts. SCALA : Introduction - Classes and objects-Basic types and operators - built-in control structures - functions and closures - inheritance

UNIT V

NoSQL Databases: Introduction to NoSQL- MongoDB: Introduction - Data types - Creating, Updating and deleing documents -Querying – Introduction to indexing – Capped collections. Hbase: Concepts - Hbase Vs RDBMS - Creating records- Accessing data - Updating and deleting data -Modifying data- exporting and importing data.

USE CASES: Call detail log analysis, Credit fraud alert, Weather forecast

Text Book

Tom White (2012). Hadoop: The Definitive Guide, Third Edition, O'Reilly Media

Reference Books

- 1. Bill Franks (2012). Taming the Big Data Tidal wave, John Wiley & Sons
- 1. Martin Odersky, Lex Spoon, Bill Venners (2010), Programming in Scala, Second Edition, Artima Press, California.
- 2. Shashank Tiwari (2011). Professional NoSOL, John Wiley & Sons
- 3. Boris lublinsky, Kevin t. Smith, Alexey, Yakubovich(2015). Professional Hadoop Solutions, Wiley
- 4. Chris Eaton, Dirk deroos et al.(2012). Understanding Big data, McGraw Hill
- 5. Min Chen (2014). Big Data : Related Technologies, Challenges and Future Prospects, Springer
- 6. Judith Hurwitz (2013). Big Data for Dummies, John Wiley & Sons

Pedagogy: Lectures, Group Discussions, Case studies

(12 Hours)

(11 Hours)

11 Hours)

22DD		002
23PD	AP	US

Preamble

This course provides implementation of statistics concepts in R and SPSS. It also provides sound introduction to implement the Hadoop framework. This course also provides various exercises to implement in the distributed environment through map reduce programming.

Prerequisite

- Statistics
- Big data framework
- Java

Course Outcomes

On successful completion of the course, the students will be able to

CO	CO Statement	Knowledge
Number		Level
CO1.	Demonstrate concepts of probability in R	K2
CO2.	Apply different probability distributions in SPSS	K3
CO3.	Apply specific Mapper and reducer functions for different situations	K3
CO4.	Design and build a hadoop cluster. create NoSQL databases using MongoDB.	K6
CO5.	Develop DML,DDL commands in Hbase.	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	S	М	М
CO2.	S	S	М	М
CO3.	S	S	М	М
CO4.	S	S	S	М
CO5.	S	S	S	М

S- Strong; M- Medium; L- Low

Syllabus

- Setting up a hadoop environment
- Exercises to implement file management tasks using Hadoop
- Exercises to implement Map reduce program that mines weather data
- Exercises to implement Stock count Map reduce program.
- Exercises to implement Pig Latin scripts to sort, group, join, project, and filter data.
- Exercises to implement CRUD, Aggregating and indexing operations in MongoDB.
- Exercises to apply the concept of MapReduce in MongoDB.
- Exercises to implement DDL, DML commands using HBase.
- Exercises to implement concepts of probability and distributions in R
- Exercises to implement concepts of probability and distributions in SPSS

Pedagogy: Demonstrations

23PDAP04	MACHINE LEARNING AND	Category	L	Τ	Р	Credits
	PYTHON LAB	Practical	-	-	75	3

Preamble This course introduces sci-kit learn, the popular machine learning library in Python. It also provides exercises to implement sci-kit learn syntax and tools to apply machine learning algorithms.

Prerequisite

- Knowledge in Open source Python
- Machine Learning

Course Outcomes

On successful completion of the course, students will be able to

CO Number	Co Statement	Knowledge Level
CO1.	Analyze basic concepts of Python	K3
CO2.	Build models using classification algorithm for real world problems	K6
CO3	Build models using clustering algorithm for real world problems	K6
CO4.	Create classification and clustering models	K6
CO5	Test and evaluate the models	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	S	S	М
CO2.	S	S	S	М
CO3.	S	S	S	М
CO4.	S	S	S	М
CO5	S	S	S	М

S-Strong; M-Medium; L-Low

Syllabus

- Exercise to develop simple web applications in Python
- Exercise to manipulate data using different queries
- Exercises to handle Exceptions, Multithreading
- Exercises to load dataset into sci-kit learn
- Exercise for Building models in sci-kit learn
- Exercise to extract features from datasets
- Exercise to implement Regression
- Exercise to implement Classification
- Exercise to implement Clustering
- Exercises for Model selection and evaluation
- Exercises to Build a data pipeline

Pedagogy: Demonstrations

23PHR01 - Fundamentals of Human Rights

Unit I: Introduction:

Meaning and Definitions of Human Rights – Characteristics and Importance of Human Rights – Evolution of Human Rights – Formation, Structure and Functions of the UNO - Universal Declaration of Human Rights – International Covenants – Violations of Human Rights in the Contemporary Era.

Unit II: Human Rights in India:

Development of Human Rights in India – Constituent Assembly and Indian Constitution – Fundamental Rights and its Classification – Directive Principles of State Policy – Fundamental Duties.

Unit III:

Rights of Marginalized and other Disadvantaged People: Rights of Women – Rights of Children – Rights of Differently Abled – Rights of Elderly - Rights of Scheduled Castes – Rights of Scheduled Tribes – Rights of Minorities – – Rights of Prisoners – Rights of Persons Living with HIVAIDS – Rights of LGBT.

Unit IV:

Human Rights Movements: Peasant Movements (Tebhaga and Telangana) – Scheduled Caste Movements (Mahar and Ad-Dharmi) – Scheduled Tribes Movements (Santhal and Munda) – Environmental Movements (Chipko and Narmada BachaoAndolan) – Social Reform Movements (Vaikom and Self Respect).

Unit V:

Redressal Mechanisms: Protection of Human Rights Act, 1993 (Amendment 2019) – Structure and Functions of National and State Human Rights Commissions – National Commission for SCs – National Commission for STs – National Commission for Women – National Commission for Minorities – Characteristics and Objectives of Human Rights Education.

References

- 1. SudarshanamGankidi, Human Rights in India: Prospective and Retrospective, Rawat Publications, Jaipur, 2019.
- 2. SatvinderJuss, Human Rights in India, Routledge, New Delhi, 2020.
- Namita Gupta, Social Justice and Human Rights in India, Rawat Publications, Jaipur, 2021.
- 4. Mark Frezo, The Sociology of Human Rights, John Willy & Sons, U.K. 2014.
- Chiranjivi J. Nirmal, Human Rights in India: Historical, Social and Political Perspectives, Oxford University Press, New York, 2000.
- 6. Dr. S. Mehartaj Begum, Human Rights in India: Issues and perspectives, APH Publishing Corporation, New Delhi, 2010.

- 7. Asha Kiran, The History of Human Rights, Mangalam Publications, Delhi, 2011.
- 8. Bani Borgohain, Human Rights, Kanishka Publishers & Distributors, New Delhi-2, 2007.

Jayant Chudhary, A Textbook of Human Rights, Wisdom Press, New Delhi, 2011

SEMESTER III

23PD 4 07	RIG DATA WITH SPARK AND HIVF	Category	L	Т	P	Credits
231 DA07	DIO DATA WITH STARK AND INVE	Theory	56	4	-	4

Preamble

operations using HiveQL and applying these to perform analytics.

Prerequisite

- Big Data Framework
- SQL

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the programming constructs of Spark and database management using HiveQL	K2
CO2	Apply the concepts of Spark QL and Hive in simple tasks. Understand writing scripts using SQL in Spark and perform various HiveQL queries by applying RDBMS concepts	K3
CO3	Analyze different types of data and its sources for use in Spark Applications.	K4
CO4	Appraise techniques for data manipulation in Hive.	K5
CO5	Design and develop scripts in Spark and Hive for various situations	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	S	М	М
CO2	S	S	М	М
CO3	S	S	S	М
CO4	S	S	S	М
CO5	S	S	М	М

S- Strong; M-Medium; L-Low

Syllabus

Overview of Big data and spark - Spark Philosophy - History of Spark - Running Spark- Spark

Architecture - Data Frames - Transformations - End to end example –Spark Toolset

- Spark run on cluster - Developing spark Applications - Deploying Spark

UNIT II:

(11 Hrs)

Structure API -Structured Spark Types -API Execution - Basic structured operations -Working with Different types of Data - Booleans, strings, dates, complex types - Working with Json - Aggregations - Grouping - Joins - Data sources.

UNIT III:

(12Hrs)

UNI

This
Spark SQL - Running Spark SQL Queries –Tables –Views - Databases - Advanced subqueries –

Dataset - Transformations_RDD - Creating RDD - Transformations - Actions - saving files - Advanced RDD - Key-value RDD - Distributed shared variables - Accumulators. Streaming: Streaming Fundamentals - Processing Design Points - Structure streaming Basics - core concepts - Input and output.

UNIT IV:

(11 Hrs)

(11Hrs)

Developing Hive – Services in Hive – Understanding Hive Data model-HiveQL: Data definition – Databases – Alter database – Create Tables – Alter Tables – Manage Tables – Drop Tables. HiveQL: **Data manipulation** – Load Data into managed tables – Insert into tables from Queries - Creating Tables and Loading Them in One Query - Exporting Data.

UNIT V:

HiveQL: Queries – SELECT ... FROM Clauses –Where Clauses – Group by clauses - Join Statements – ORDER BY and SORT BY- DISTRIBUTE BY with SORT BY- CLUSTER BY – casting - UNION ALL - HiveQL: Views - HiveQL: Indexes - Schema Design – Tuning – Functions – Customizing Hive File and Record formats - Case Studies.

Text Books

- 1. Bill Chambers and Matei Zaharia(2018). "Spark: The Definitive Guide", O'Reilly Media.
- 2. Jason Rutherglen, Dean Wampler, Edward Capriolo (2012). Programming Hive, First edition, O'Reilly Media.

Reference Books

- 1. Hanish Bansal, Saurabh Chauhan (2016). Apache Hive Cookbook, Packt publishing.
- 2. Mike Frampton, Mastering Apache spark, Pack Publishing.
- 3. Jules.S.,Brooke Wenig,Tathagata Das& Denny Lee(2020)."Learning Spark", O'Reilly Media.
- 4. Holden Karau & Rachel Warren, (2017), "High Performance Spark", O'Reilly Media.

Unit	Торіс	Activity	Web References		
Unit	Apache Spark	Sequence	https://intellipaat.com/blog/tutorial/spark-tutorial/spark-		
Ι	Architecture-	of	architecture/		
		Questions	https://www.edureka.co/blog/spark-architecture/		
Unit	Aggregations-	Packet of	http://sqlandhadoop.com/spark-dataframe-aggregate-functions/		
II	Grouping-Joins-	Problems	https://medium.com/@achilleus/https-medium-com-joins-in-		
			apache-spark-part-1-dabbf3475690		
			https://mungingdata.com/apache-spark/aggregations/		
Unit	Spark SQL	Student-	https://docs.databricks.com/spark/latest/spark-sql/language-		
III	Queries-tables-	generated	manual/create-view.html		
	Views	content			
Unit	Data	Group	https://www.oracle.com/technetwork/topics/bigdata/articles/hive-		
IV	manipulation	Discussion	and-pig-hol-1937050.pdf		
			https://www.rcvacademy.com/big-data/hiveql-data-manipulation/		
Unit	Queries –	Discussion	https://www.guru99.com/hive-queries-implementation.html		
V	SELECT FROM	activities			
	Clauses Where				
	Clauses – Group				
	by clauses				

Pedagogy: Lectures, Demonstrations, Case studies

23PDA08

Preamble

This course presents the different aspects of statistics likeANOVA, design of an experiments, control charts, multivariate analysis, Correlation and regression, which enables the student to analyze, organize, present and interpret data effectively.

Course Outcomes

Upon the successful completion of the course, students will be able to

CO	CO Statement	Knowledge
Number		Level
CO1	Understand the basic concepts of analysis of variance	K2
CO2	Apply the concept of partial, multiple correlation and regression for solving problems	К3
CO3	Apply statistical inference and control charts to applications	K4
CO4	Analyse and interpret data using techniques like multivariate statistics	K5
CO5	Design the experiments using methods like Randomized block and Latin squares	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	М	S	S
CO2	S	S	S	М
CO3	S	S	М	М
CO4	М	S	S	М
CO5	S	S	S	М
	1616	1º T	т	

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

Analysis of variance: One way and Two way analysis: Introduction – Single factor experiment and linear statistical model - Fixed effects mode and ANOVA - Random effects model and ANOVA -Computation for sum of squares – Multiple comparison test : Grouping of means – Single factor experimental and linear statistical model – Fixed effective model for two way ANOVA – Random effective model for two way ANOVA – Computation for sum of squares.

UNIT II

Introduction - Randomized block design- Advantages of a completely randomized experimental design – Latin squares – Significance of Latin squares – Assumption in the Analysis of Latin squares - Randomized block Vs. Latin squares - Latin Cubes - Factorial experiment.

UNIT III

Introduction - Statistical quality control: Relation Between Confidence Limit and control limit-

39

(11 Hrs)

(11 Hrs)

(11 Hrs)

Types of Control chart's – Control charts for variables X-chart, R-chart, S-chart, X-chart – Control chart for attributes: p-chart, C-chart, – Out of control situations in control chart and process monitoring – Process capability and process capability index – Six sigma: Six sigma metrics- Sigma Levels and Process Capabilities.

Use cases: Process Control and Product Control in Industry

UNIT IV

(11 Hrs)

Multivariate Analysis – Basic concepts – Measurement Scales – Measurement Error – Statistical significance – Types of multivariate techniques – guidelines for multivariate analyses and interpretation – structured approach to multivariate model building – preparing data for a multivariate analysis – graphical examination of the data – missing data and its approaches – methods of detection of outliers – testing the assumptions of multivariate analysis

UNIT V

(12 Hrs)

Correlation ratio: -Multiple and partial correlation:Yule's Notation-Plane of regression-Properties of residuals :Variance of residual-Coefficient of multiple correlation:Properties of multiple correlation coefficient-Coefficient of partial correlation-Multiple correlation in terms of total and partial correlation-Multiple correlation Multiple Regression Analysis-Multiple Regression-Expression for regression coefficient in terms of regression coefficients of lower order.

Reference Books

- 1. Johnson R. A. and Wichern, W (2001): Applied Multivariate Statistical Analysis, Fifth edition, Prentice Hall.
- 2. S.P.Gupta : Statistical Methods, Third Revised Edition 2004.
- 3. Dr.J.Ravichandran, Probability and Statistics for Engineers, Wiley 2015.

Pedagogy: Lectures, Demonstrations, Case studies

23PD A 00	DATA MININC	Category	L	Т	Р	Credit
231 DA07		Theory	56	4	-	4

This course presents the basic concepts of data mining and data warehousing, various data mining techniques like classification, clustering, association rule mining. The course also introduces various applications of data mining, data visualization using Tableau

Prerequisite

- Database Management Systems
- Probability and Statistics

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand basic concepts of data mining and data warehousing	K2
CO2.	Apply data mining techniques to carry out simple data mining tasks	K3
соз.	Examine data mining techniques like classifications, clustering,	K4
CO4.	Compare data mining algorithms using Tools	K5
CO5.	Design solutions with data visualization using Tableau	K6

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

(11Hrs)

(11 Hrs)

(12 Hrs)

Introduction to data mining: Mining from database - Data mining functionalities - Mining patterns - Classification of data mining systems - Major issues in Data mining. Data warehouse - Multi dimensional Data Model - Data warehouse Architecture - Data warehouse Implementation - Data warehousing to Data Mining.

UNIT II

Data Preprocessing: Need for preprocessing – Data summarization – Data cleaning – Data integration - Data transformation – Data reduction – Data discretization.

UNIT III

Association Rule Mining: Basic concepts - Frequent Itemset Mining Methods - Pattern Evaluation Methods –Density Based Clustering- Grid-Based Methods – Clustering High-Dimensional Data – Evaluation of clustering

41

UNIT IV

Outlier Detection:Outliers and Outlier Analysis - Outlier Detection Methods - Proximity-Based Approaches - Outlier Detection in High-Dimensional Data – Data visualization : Foundations for building visualizations-visualizing data – working with data in Tableau – Moving from foundational to Advanced visualizations.

UNIT V

(12 Hrs)

Mining Complex Data -Time-Series, Symbolic Sequences, and Biological Sequences – Graph mining - Applications of Data Mining: Financial Data Analysis - Retail and Telecommunication Industries - Intrusion Detection and Prevention- Recommender Systems- Data mining applications in functional areas like Banking, Marketing, Stock Market, Retail Marketing.

Text Book

- 1. Jaiwei Han, Micheline Kamber (2006). Data Mining-concepts and techniques, 2/e, Morgan Kaufmann Publishers, San Francisco
- 2. Joshua N.Milligan (2015), Learning Tableau, Packt Publishing

Reference Books

- 1. Mark A. Hall, Ian H. Witten, Eibe Frank (2011). Data Mining: Practical Machine Learning
- 1. Toolsand Techniques, 3/e, Morgan Kaufmann Publishers, San Francisco
- 2. Arun K. Pujari (2001). Data Mining Techniques; Universities Press, Hyderabad
- 3. Soman KP (2005). Data mining from theory to practice, 2/e, PHI Learning Pvt. Ltd., New Delhi

Pedagogy: Lectures, Demonstrations, Case studies

23PDA10	RESEARCH METHODOLOGY	H METHODOLOGY Category L T P Credit Theory 30 2				
251 0/110		Theory	30	-	-	2

This course presents the concepts of research, types of research, research design, literature review, writing reports and adhering to research ethics.

Prerequisite

This course is most appropriate for post graduate students who are interested in research but do not have prior research experience.

Course Outcomes

On successful completion of the course, the students will be able to

	Understand the concepts of research, research design, research	K2
CO1.	process for measurement, scaling and data collection	
CO2.	Apply statistical methods for processing the research data.	K3
CO3.	Examine different methods of design and research approaches.	K4
CO4.	Analyze the process of hypothesis testing and report writing	K5
	Design solutions for research problems in a responsible and ethical	K6
CO5.	manner	

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	М	М	М
CO2.	S	М	М	М
CO3.	S	S	S	М
CO4.	S	S	S	М
CO5.	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

(6 Hrs)

An Introduction: – Meaning of research – Objective of research – Types of research – Research approaches – Significance of research – Research methods versus Methodology – Research and scientific method – Research process.

Defining the research problem: What is research problem? – Selecting the problem – Necessity of defining the problem. Research Design: Meaning of research design – Need for research design – Features of a good design – Different research designs.

UNIT II

(6 Hrs)

Measurement and scaling techniques: Measurement in research – Measurement scales – Sources of error in measurement – Tests of sound measurement – Technique of developing measurement tools – scaling – Meaning of scaling – Scale classification bases.

Methods of Data Collection: Collection of primary data – Observation method – Interview method – Collection of data through schedules - Collection of secondary data – Selection of appropriate method for data collection.

UNIT III

Processing and Analysis of Data: Processing operations – Some problems in processing – Elements/Types of Analysis - Statistics in research – Measures of central tendency – Measures of dispersion – Measures of Asymmetry – Measures of relationships

UNIT IV

Testing of Hypotheses: Introduction to Hypothesis – Basic concepts concerning testing of Hypotheses - Procedure for Hypothesis testing – Measuring the power of a Hypothesis testing - Tests of Hypothesis. Interpretation and report writing: Meaning of interpretation – Technique of interpretation – Significance of report writing – Different steps in writing report – Layout of the research report – Types of reports.

UNIT V

Research Ethics –Brief history and analytical basis of research ethics, responsible conduct in research (Honesty in Science: Integrity, Authorship, Conflicts of Interest, Privacy and Confidentiality, Informed Consent, Risk/Benefit Assessment), The legal regulation of research ethics in India (From UGC, MHRD and other governing agencies), Regulatory requirements relevant to international research.

Text Book

Kothari, C.R (2013), Research Methodology – Methods and Techniques, 2/e. Wiley Eastern Limited

Reference Books

- 1. R. Panneerselvam (2014), Research Methodology, 4/e. Prentice Hall India Learning Private Limited.
- 2. Ranjit Kumar (2019), Research Methodology A step- by-step guide for beginners, 5/e. Pearson Education.
- 3. Deepak Chawla and Neena Sondh (2011), Research Methodology, Concepts and Cases, Vikas Publishing House Pvt. Ltd.
- 4. On Being a Scientist, A Guide to Responsible Conduct in Research: Third Edition (2009)
- 5. Role of the Ethics Committee: Helping To Address Value Conflicts or Uncertainties Author links open overlay panel Mark P.Aulisio, Robert M.Arnold.
- 6. https://www.glos.ac.uk/docs/download/Research/handbook-of-principles-and-procedures.pdf.
- 7. Research Regulatory Compliance 1st Edition (Mark Suckow, Bill Yates eBook ISBN: 9780124200654)
- 8. Recent research ethics policy from Government of India.

Pedagogy: Lectures, Demonstrations, Case Studies, Group Discussions

(6 Hrs)

(6 Hrs)

(6 Hrs)

Category	L	Т	Р	Credit
Practical	-	-	75	3

This course provides implementation of the Hadoop components like Hive and Spark. This course also provides various exercises to implement the components in the distributed environment through mapreduce programming.

Prerequisite

- Big data framework
- NoSQL concepts

Course Outcomes

On successful completion of the course, the students will be able to

СО	CO Statement	Knowledge
Number		Level
CO1.	Understand Hadoop components for big data processing.	K2
CO2.	Apply simple processing operations in Spark.	K3
	Apply concepts to transfer various file formats into Hive for	
CO3.	Processing.	K3
CO4.	Develop Spark SQL for data processing	K6
CO5.	Create Hive commands for big data applications using Hadoop.	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	S	S	М
CO2.	S	S	S	М
CO3.	S	S	S	М
CO4.	S	S	S	М
CO5.	S	S	S	М

S- Strong; M- Medium; L- Low

Syllabus

- Exercises to implement HiveQL to sort, order, group, distribute and cluster.
- Exercises to implement partitioning and bucketing in Hive.
- Exercises to create joins, views and indexes in Hive.
- Exercises to transfer the contents of XML, JSON and ORC files into Hive for processing.
- Exercises to implement simple processing tasks in Spark
- Exercises to implement basic operations in Spark SQL.

Pedagogy: Demonstrations

23PDAP06	DATA MINING AND VISUALIZATION LAB	Category	L	Т	Р	Credits
		Practical	-	-	75	3

This course provides exercises to implement data mining techniques such as classification, clustering, association rule mining, text mining using R and also introduces data visualization using Tableau.

Prerequisite

- Data mining
- Data visualization concepts

Course Outcomes

On successful completion of the course, students will be able to

CO	CO Statement	Knowledge
Number		Level
CO1.	Construct programs for implemented the association rule mining, classification, clustering, Prediction algorithm using R	К3
CO2.	Apply data mining techniques to real world problem	K3
CO3.	Analyze data using data visualization tool and provide interpretation.	K4
CO4.	Evaluate the features of various data mining and visualization tools using Tableau .	К5
CO5	Develop algorithm based solutions and visualizations for the given problems.	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	S	Μ	М
CO2.	S	S	Μ	М
CO3.	S	S	Μ	М
CO4.	S	S	S	М

S- Strong; M-Medium; L-Low

Syllabus

- Exercise to implement the concept of classification in R
- Exercise to implement the concept of clustering in R
- Exercise to find associated items in dataset using R.
- Exercise to perform text classification using the movie review dataset in R.
- Exercise to create a corpus of documents and preprocess them in R using stemming, stop word removal, whitespace removal, convert them to lowercase and remove punctuations.
- Exercise to create a term document matrix for a corpus in R.
- Exercise to find the frequent terms in a document and remove sparse terms in R
- Exercises to visualize data using Bar chart, Line chart, Pie chart, Scatterplot and Histogram.
- Exercises to create Dashboard, analytics report for a dataset.
- Exercises to create Story by combining worksheets/dashboards.

Pedagogy: Lectures, Demonstrations

SEMESTER IV

		Category	L	Т	Р	Credits
23PDA11	CLOUD COMPUTING	Theory	-	-	-	2

Preamble

This course covers various services of cloud computing. It also presents cloud computing collaborations and applications. It covers new concept of virtualization and applications

Prerequisite

Web Technology

Course Outcomes

On successful completion of the course, students will be able to

CO	CO Statement	Knowledge
Number		Level
CO1.	Understand the concepts of cloud Architecture and its services	K2
CO2.	Learn to identify different services providers, its services and tools.	К3
CO3.	Analyze various web based applications for collaborating everyone in the cloud computing.	K4
CO4.	Evaluate the best service provider for cloud computing in terms of storage, Services	К5
CO5.	Choose from various industrial platforms for development	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	М	М	М
CO2.	S	М	М	М
CO3.	S	S	М	М
CO4.	S	М	S	М
CO5.	S	S	S	М

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

Introduction: Benefits and Limitations-Cloud Architecture – Storage – Services –Service Providers - Types of Cloud Service Development – Services and Tools

UNIT II

Collaborating on Contact Management - Collaborating on Project Management- Collaborating on Word Processing, Spreadsheet, Presentations, Databases- Sharing Files and Photographs

UNIT III

Cloud Virtualization Technology –Virtualization Defined–Virtualization Benefits–Server Virtualization – Virtualization for x86 Architecture – Hypervisor Management Software – Logical Partitioning – VIO Server – Virtual Infrastructure Requirements

UNIT IV

Deep Dive: Cloud Virtualization –Introduction - Storage Virtualization–Storage Area Networks– Network Attached Storage – Cloud Server Virtualization – Virtualized Data Center - Classification of Data center - Overview of Data center environment.

UNIT V

Industrial platforms and new developments - Amazon web services: Compute services - Storage services - Communication services - Additional services - Google AppEngine: Architecture and core concepts - Application life cycle - Cost model Microsoft Azure: Azure core concepts - SQL Azure - Windows Azure platform appliance - Cloud Applications: Scientific Applications – Business and Consumer applications

Reference Books

- 1. Michael Miller (2011). Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Pearson publication.
- 2. Dr. Kumar Saurabh (2011). Cloud Computing : Insights into New Era Infrastructure, Wiley India
- 3. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi (2013). Mastering Cloud Computing Foundations and Applications Programming, Morgan Kaufmann is an imprint of Elsevier
- 4. Rishabh Sharma (2014). Cloud Computing: Fundamentals, Industry Approach and Trends, Wiley India edition.
- 5. Paul Mehner (2013). Cloud Computing with the windows Azure Platform, Microsoft Press US.

This course provides the classification of cybercrime, Botnets, attacks on the mobile devices, tools and methods used in cybercrime, laws of cybercrime and cyber forensics.

Prerequisite

- Basic fundamental knowledge of Networking
- Web Application
- Mobile Application
- Relational Database Management System

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of cybercrime and cyber forensics	K2
CO2	Apply methods of the cyber crime	K3
CO3	Analyze the techniques used for cybercrime and forensics.	K4
CO4	Evaluate tools and methods applied in cybercrime	K5
CO5	Create methodologies to secure data in the real world	K6

Mapping of Course Outcome with Programme Outcome

Cos	PO1	PO2	PO3	PO4
CO1.	S	S	М	М
CO2.	S	S	М	Μ
CO3.	S	S	S	S
CO4.	S	S	S	S
CO5.	S	S	S	S

S- Strong; M-Medium; L-Low Syllabus

Unit I

(11 hrs)

Introduction to Cybercrime: Introduction, Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Newsgroup Spam/Crimes from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Password Sniffing, Credit Card Frauds and Identity Theft. Cyber offenses: How Criminals Plan that attack, Categories of Cybercrime, How Criminals Plan the Attacks: Passive Attack, Active Attacks, Scanning/Scrutinizing gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector and Cloud Computing

Unit II

(12 hrs)

Cybercrime- Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security

Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era and Laptops.

Unit III

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft): Types of Identity Theft, Techniques of ID Theft, Identity Theft Countermeasures, How to Protect your Online Identity.

Unit IV

Cybercrimes and Cybersecurity: The Legal Perspectives Introduction, Why Do We Need Cyberlaws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act,, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

Unit V

Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail : RFC282, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing and Anti forensics.

Pedagogy

Lectures, Group Discussions, Demonstrations

Text Books

Nina Godbole, Sunit Belapur, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Publications, April, 2013

Reference Books

- 1. James Graham, Richar Howard, Ryan Olson, "Cyber Security Essentials", CRC Press, Tailor and Francis Group, 2013
- 2. Robert Jones, "Internet Forensics: Using Digital Evidence to Solve Computer Crime", O'Reilly Media, October, 2005
- 3. Chad Steel, "Windows Forensics: The field guide for conducting corporate computer investigations", Wiley India Publications, December, 2006

(11 hrs)

(**11 hrs**)

(11 hrs)

23PDAPR1	PROJECT WORK AND VIVA VOCE	Category	L	Т	Р	Credits
	PROJECT WORK AND VIVA VOCE	Project	-	-	-	8

To build problem solving ability and technical skills through the application of theoretical concepts for modeling the real world problems using latest technologies in data analytics.

Prerequisite

- Domain knowledge
- Data Set Description
- Machine learning tools for algorithms.
- Technologies

Outcomes

On successful completion of the project, the students will be able to

- Design solutions using data sets for real world problems
- Develop solutions in various domains for contemporary scenarios

Methodology

- Identify the domain and problem
- Decide the software tool to carry out the work
- Design and develop the solution
- Analyze and interpret the findings
- Document the work

ELECTIVE – I

23PDAE01	DATA STRUCTURES	Category	L	Т	Р	Credit
		Theory	56	4	-	4

Preamble

This course covers the various data structures, including arrays, structures, stacks and queues. It includes sorting and searching techniques and effective search methods in Binary trees. This course also deals with graph data structures.

Prerequisite

• Discrete mathematics.

Course Outcomes

On successful completion of the course, the students will be able to

CO	CO Statement	Knowledge
Number		Level
CO1.	Understand the concepts of arrays, strings and algorithms for basic operations.	K2
CO2.	Apply concept of stacks, queues, linked list and algorithms for basic operations.	К3
CO3.	Identify the familiarity with major algorithms and data structures	K4
CO4.	Analyze appropriate algorithms and data structures for various applications	K5
CO5.	Formulate the computational complexity of various algorithms	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	М	М	М
CO2.	S	М	М	М
CO3.	S	S	М	М
CO4.	S	S	S	М
CO5.	S	S	S	М

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

(11 Hours)

Basics: Algorithm Specification – Data Abstraction – Performance Analysis – Arrays – Dynamic Allocated Arrays – Structures and Unions – Polynomials - Sparse Matrices- Representation of Multidimensional Arrays – Strings.

UNIT II

(12 Hours)

Stacks and Queues: Stacks – Stacks Using Dynamic Arrays - Queues - Circular Queues Using Dynamic Arrays - Evaluation of Expressions - Multiple Stacks And Queues **Linked Lists:** Singly Linked List And Chains – Representing Chains in C – Linked Stack And Queues – Polynomials - Additional List Operations - Sparse Matrices – Doubly Linked List.

UNIT III

Searching: Introduction - Sequential Search - Binary Search. **Sorting :** Introduction - Insertion Sort - Selection Sort - Merge Sort - Quick Sort - Heaps and Heap Sort.

UNIT IV

Efficient Binary Search Trees: Optimal Binary Search Trees – AVL Trees- KD Trees.

UNIT V

Graphs: The graph Abstract Data Type- Elementary graph operations- Minimum cost spanning trees- shortest paths and transitive closure- AOV networks –AOE networks.

Text Book

- 1. Ellis Horowitz, Sartaj Sahni and Anderson Freed (2009), Fundamentals of data structures in C, University Press
- 2. Ellis Horowitz, Sartaj Shani, Sanguthevar Rajasekaran (2013), Fundamentals of computer algorithms, Galgotias Publications private limited
- 3. Robert L Kruse (2008). Data Structures & Program Design, New Delhi: Prentice Hall

Reference Books

- 1. Mark Allen Weiss(2012). Data Structures and Algorithm Analysis in C++; Pearson Education
- 2. Sartaj Sahni (2010). Data Structures, Algorithms, and Applications in C++; McGraw-Hill International Edition
- 3. AlfredV.Aho, John E.Hopcroft, Jeffrey D.Ullman (2000). Data structures and algorithms; Pearson Education, Asia.
- 4. Adam Drozdek (2013). Data Structures and Algorithm in C++ , 4th Edition.

Pedagogy: Lectures, Group Discussion, case study

(11 Hours)

(11 Hours)

(11 Hours)

23PDAE02 INFORMATION		Category	L	Т	Р	Credit
	INFORMATION RETRIEVAL	Theory	56	4	-	4

This course presents the concepts of document representation, document indexing, digital information storage, retrieval and distribution. It also introduces effective search strategies for IR systems, vector space model, text classification and evaluation methods of IR systems.

Prerequisite

- Database Management systems
- Data mining

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate the concepts of document representation, document indexing, digital information storage, retrieval and distribution	K2
CO2	Apply the concepts of vector spaces and classifiers to perform document classification.	K3
CO3	Examine the advantages and disadvantages of different information- retrieval models	K4
CO4	Determine the effective search strategies for IR systems	K5
CO5	Able to develop information retrieval system for specific use cases.	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	М	М	М
CO2.	S	М	М	М
CO3.	S	S	М	М
CO4.	S	Μ	S	Μ
CO5.	S	S	S	М

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

(11Hrs)

Boolean retrieval: Information retrieval problem - Processing Boolean queries - Boolean model versus ranked retrieval. The term vocabulary and postings lists: Document delineation and character sequence decoding - Determining the vocabulary of terms - Faster postings list intersection via skip pointers - Positional postings and phrase queries

UNIT II

(**12Hrs**)

Dictionaries and tolerant retrieval: Search structures for dictionaries - Wildcard queries - Spelling correction - Phonetic correction. Index construction: Hardware basics - Blocked sort-based indexing - Single-pass in-memory indexing - Distributed indexing - Dynamic indexing - Other types of indexes

UNIT III

Scoring, term weighting and the vector space model: Parametric and zone indexes - Term frequency and weighting - The vector space model for scoring. Evaluation in information retrieval: Information Retrieval system – Standard test Collection – Evaluation of unranked retrieval sets – Evaluation of ranked retrieval results – Assessing relevance

UNIT III

XML retrieval : Basic XML concepts – A vector space model for XML retrieval – Evaluation of XML retrieval - Text-centric vs. data-centric XML retrieval. Text classification and Naive Bayes: The text classification problem - Naive Bayes text classification - Properties of Naive Bayes - Feature selection - Evaluation of text classification

UNIT V

Vector space classification: Document representations and measures of relatedness in vector spaces – Rocchio classification - Flat clustering: Clustering in information retrieval - Evaluation of clustering - K-means – Web search basics - Web characteristics - Advertising as the economic model – Search user experience – Basic Page Rank

Text Book

Christopher D. Manning, Prabhakar Raghavan, Henrich Schutze (2008). Introduction to Information Retrieval, 1/e; New York: Cambridge University Press

Reference Books

- 1. Stefan Buttcher et.al (2012). Information Retrieval Implementing and Evaluating, MIT Press
- 2. Dr Ricardo Baeza-Yates et.al (2011). Modern Information Retrieval: The Concepts and Technology, Addison Wesley
- 3. David A. Grossman and Ophir Frieder (2010). Information Retrieval, 2/e, Universities Press

Pedagogy: Lectures, Demonstrations, Guest Lecture, Video Lectures

(11Hrs)

(11 Hrs)

(11Hrs)

ELECTIVE – II

23PD 4 E03	RDRMS AND SOL	Category	L	Т	Р	Credit
251 DAL05	251 DAE05 RDBM5 AND SQL	Theory	56	4	-	4

Preamble

This course presents the fundamental concepts of Database Management Systems, database design and Relational model. It provides concepts of how to apply these in practice and learn how to use the structured query language to work and analyse databases.

Prerequisite

- Database
- Programming concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of relational databases, database design Using ER diagram	K2
CO2	Demonstrate various SQL queries by applying RDBMS concepts	K3
CO3	Analyze various real time applications for applying RDBMS concepts.	K4
CO4	Evaluate constraints on data and identify situations to apply the constraints.	К5
CO5	Design different databases for various situations	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	S
CO5	S	S	S	S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I:

(11 Hours)

Overview of database systems: Managing Data - A Historical Perspective - File System versus DBMS – Advantages of a DBMS - Describing and Storing data in a DBMS - Queries in a DBMS - Transaction Management - Structure of a DBMS.

UNIT II:

(11 Hours)

Database Design & ER diagrams - Entities, Attributes and Entity Sets - Relationships and Relationship Set - Additional features of the ER model - Conceptual Database design with ER Model.

UNIT III:

Relational Model: Introduction - Integrity Constraints Over Relations - Enforcing Integrity Constraints on Relational Data - Logical Database Design: ER to Relational - Introduction to Views - Destroying / Altering Tables and Views - Relational Algebra and Calculus.

UNIT IV:

SQL Queries, Constraints, Triggers: The form of a Basic SQL Query - UNION, INTERSECT and EXCEPT - Nested Queries - Aggregate Operators - Null Values - Complex integrity constraints in SQL - Triggers and Active Data bases – Query Evaluation.

UNIT V:

PL/SQL Programming: Functions and Procedures, Triggers, Queries, Forms, Reports, Cursors, Exceptions. Introduction to NoSQL – Types.

Text Book

Raghu Ramakrishnan and Johannes Gehrke (2003). Database Management System, Third edition, McGraw-Hill.

Reference Books

- 1. Abraham Silberschatz, Henry F. Korth and Sudarshan S(2005). Database System Concepts,5/e, McGraw-Hill.
- 2. Date CJ (2003). An Introduction to Database Systems,8/e, Pearson Education.
- 3. Michael Mclaughlin, (2010).Oracle Database 11g PL/SQL Programming, McGraw Hill.
- 4. Shashank Tiwari (2011). Professional NoSQL, John Wiley & Sons

Pedagogy: Lectures, Group Discussion, case study

(12 Hours)

(11 Hours)

(11 Hours)

This course covers the concepts of information security, ethical hacking, policies standards and security practices, risk management, implementation and maintenance processes. It also deals with managerial, technical aspects, physical security and cryptographic techniques of information security.

Prerequisite

- Cryptography
- Internet, firewalls, attacks, and threats

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the need of Information Security, polices, standards and security blue print of an organization	К2
CO2.	Apply cryptographic algorithms in real time applications	К3
CO3.	Analyse different types of physical security techniques	K4
CO4.	Assess the behavior of different threats and attacks	K5
CO5.	Propose solutions for cybersecurity issues using various models.	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	М	М	М
CO2.	S	М	М	М
CO3.	S	М	М	М
CO4.	S	S	М	М

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

Introduction to Information Security: Introduction- - Security - Critical Characteristics of Information - NSTISSC Security Model - Components of an Information System - Security Components - Approaches to Information Security Implementation - The Systems Development Life Cycle - The Security Systems Development Life Cycle

UNIT II

(12 Hrs)

(11 Hrs)

The Need for Security: Business Needs First - Threats - Attacks - Secure Software Development. Risk management: Overview - Risk Identification - Risk Assessment- Risk Control Strategies -Selecting a Risk Control Strategy - Quantitative Versus Qualitative Risk Control Practices -Planning for Security: Information Security Policy, Standards and Practices - The Information

Security Blue print

UNIT III

Security Technology: Firewalls and VPNS - Intrusion Detection, Access Control, and other Security Tools - Intrusion Detection and Prevention Systems - Honey Pots - Honey Nets, and Padded Cell Systems - Scanning and Analysis Tools - Access Control Devices

UNIT IV

(11 Hrs)

Cryptography: Foundations of Cryptology- cipher methods- cryptographic algorithms – cryptographic tools. Physical Security: Physical access controls – fire security and safety – failure of supporting utilities and structural collapse – Interception of data – mobile and portable systems – special considerations for physical security threats

UNIT V

(11 Hrs)

Implementation of Information Security: Information Security Project Management -Technical Topics of Implementation - Non Technical aspects of Implementation Information Security Maintenance: Security Management Models - The Maintenance Model -Digital forensics

Text Book

Michael E. Whitman and Herbert J. Ma ttord (2014). Principles of Information Security, 5/e, Cengage Learning, Indian edition

Reference Books

- 1. Charles A.Sennewald(2020). Effective Security Management, 7/e, Elsevier
- 2. Dhiren R. Patel(2008). Information Security: Theory and Practice, Prentice Hall of India PvtLtd
- 3. S.M. Bhaskar, S.I. Ahson(2008). Information Security: A Practical Approach, Alpha Science
- 4. Gerald L.Kovacich(2016). Information System Security Officer's Guide(3/e), Butterworth Hinemann

Pedagogy:

Lectures, Case Analysis, Group Discussions, Demonstrations

ELECTIVE – III

		Category	L	Т	Р	Credits
23PDAE05	DATA SCIENCE WITH PYTHON	Theory	56	4	-	4

Preamble

This course introduces the concepts of Python for data science as well as programming in general. It covers the core programming concepts of python, advanced concepts like regular expressions, exception handling, multithreading, web programming and data base programming. It also introduces the python libraries that are most commonly used for data analysis.

Prerequisite

·Basic understanding of Open source software

• Database concepts

Course Outcomes

On successful completion of the course, the students will be able to

CO	CO Statement	Knowledge
Number		Level
CO1.	Understand the programming constructs of Python	K2
CO2.	Demonstrate the concepts of Python in simple tasks	K3
	Analyse the utilities of Python with other object oriented programming	K/
CO4 .	languages	174
	Identify features to be applied for applications development in various	V5
CO3.	domains	N)
CO5.	Design solutions for data analytics problems	K6

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	S	S	М
CO2	S	S	S	М
CO3	S	S	S	М
CO4	S	S	S	М
CO5	S	S	S	М

Syllabus

Unit I

(10 Hrs)

Introduction: Origins - Features - Getting started-Python Basics - Python Objects - Numbers - Sequences - Strings, Lists and Tuples: - Strings - Strings and operators - String only operators - Built-in functions - String - Built-in methods - Special features of strings

Unit II

(12 Hrs)

Lists - Operators – Built in functions - List Type built-in methods - Special features of Lists, Tuples - Operators and Built-in functions - Special features of Tuples – Mapping and setting Dictionaries – Operators - Built-in and factory functions - Mapping types-built-in methods - Dictionary keys. Set types - Operators - Built-in function - Set type built-in methods

Multithreaded programming

Unit IV (11 Hrs)

Files & I/O: File objects - Built in Functions - Methods - Built in Attributes - Standard files -Command line arguments - File System - File Execution - Storage Modules. Exception Handling: Exception - Exception Handling - Except clause - Try- Finally clause - User Defined Exceptions.

Unit V

Unit III

Python Libraries – NumPy, SciPy, MatplotLib, Pandas, NLTK

(12 Hrs)

Note: Examples, exercises and case studies related to data analytics

Text Book

Wesley J.Chun (2010). Core Python programming, 2/e, Pearson education.

Reference Books

- 1. Mark Lutz (2010). Programming Python, 4/e, O'Reilly Media.
- 2. Mark Summerfield (2009), Programming in Python 3, Pearson Education.
- 3. Alberto Boschetti, Luca Massaron (2016), Python Data Science Essentials, Packt Publishing.

Pedagogy: Lectures, Demonstrations, Case studies

(11 Hrs) Conditionals and loops. Functions and functional programming - Modules - Regular expressions -

23PDAE06	WEB DATA ANALYTICS	Category	L	Т	Р	Credit
		Theory	56	4	-	4

This course gives insights about leveraging web data to achieve strategic business objectives. It deals with the various techniques for analysing web data like click stream analysis. The course also provides ways to execute competitive intelligence analysis and to analyze emerging social, mobile and video data.

Prerequisite

- Foundations of Data Science
- Data Mining

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
1 (unioei		Lievel VO
CO1.	Understand the techniques of web data analytics	K 2
CO2.	Apply web data analytics on social, mobile and video data	K3
GOA	Analyza tashnigung for magguring the guagage of a website	V 4
CO3.	Analyze techniques for measuring the success of a website	N 4
CO4.	Assess the various cases to apply web data analytics	K5
CO5.	Propose new metrics based solutions for user websites.	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	М	М	М
CO2.	S	S	М	М
CO3.	S	М	S	М
CO4.	S	S	S	М
CO5.	S	S	М	М

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

Introduction : Web Analytics 2.0 - Clickstream- multiple outcome analysis-experimentation and testing- voice of customer – competitive intelligence- the tactical shift -Optimal strategy for choosing web analytics

UNIT II

Clickstream analysis: Metrics-Eight critical web metrics-web metrics demystified –strategically aligned tactics for impactful web –Web analytics report-Foundational analytical strategies-clickstream analysis made actionable-challenges

(11 Hrs)

(11 Hrs)

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UNIT III

Measuring Success-Actionable Outcome KPIs- Moving beyond conversion rates- Micro and macro conversion-Measuring success for a non –ecommerce website- Leveraging qualitative data: Surveys-Web enabled emerging user research options

UNIT IV

A/B Testing - Multivariate testing-Actionable testing ideas-Controlled experiments-Competitive intelligence analysis-CI data source, types, secrets- website traffic analysis-Search and keyword analysis- audience identification and segmentation analysis

UNIT V

Emerging analytics: Social. mobile, video: Measuring social web - the data challenge- analyzing mobile customer experiences-measuring the success of blogs- quantifying the impact of Twitter – Analyzing the performance of videos.

Text Book

- 1. Avinash Kaushik (2010), Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity, 1st Edition, Wiley Publishing.
- 2. Dietmar Jannach, Markus Zanker(2011), Recommender system-An introduction, Cambridge University Press
- 3. Bing Liu(2012), Sentiment Analysis and opinion mining, Morgan and claypool Publishing

Reference Books:

- 1. Eric Enge, Stephan Spencer, Jessie Stricchiola, The Art of SEO: Mastering Search Engine Optimization, 3rd Edition.
- 2. Kristina Halvors, Content Strategy for the Web, 1st Edition.

Pedagogy: Lectures, Demonstrations, Group Discussions

(12 Hrs)

(11 Hrs)

(11 Hrs)

ELECTIVE IV

23PDAE07	SOCIAL MEDIA ANALYTICS	Category	L	Т	Р	Credit
		Theory	56	4	-	4

Preamble

The course covers concepts and techniques for retrieving, exploring, visualizing, and analyzing social network and social media data. Students learn the key metrics to assess social media goals, perform social network analysis to apply social media analytics process and formulate effective strategies based on the analytics.

Prerequisite

• Foundations of Data Science

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand sources and limitations of social media data.	K2
CO2	Apply social media analytics process and evaluate metrics.	K3
CO3	Examine different social media platforms and their associated tools	K4
CO4	Apply social media information to create dashboards and reports for visualization.	K5
CO5	Design effective strategy based on the social media analytics data	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	М	М	М
CO2	S	S	М	М
CO3	S	М	S	М
CO4	S	S	S	М
CO5	S	S	М	М

S- Strong; M-Medium; L-Low

Syllabus

Unit I :

Foundation for Analytics: – Digital Gap – Social Media Data Sources – Defining Social Media Data – Data Sources – Estimated vs. Factual Data Sources – Data Gathering in Social Media Analytics. **From Data to Insights :** Actionable Analytics – Focus on objective – Plan to shape data to insights – Choosing a good analytics tool – Data Aggregation calculations and display – Data display – Social media and Big data – Potential Challenges. **Data Identification :**Professional networking sites - social sites – information sharing sites – microblogging sites – blogs /wikis.

(12 Hrs)

(11 Hrs)

Analytics in social Media :Types of analytics. Dedicated Vs. Hybrid Tools – Dedicated tools – Hybrid tools – Data Integration Tools – Best Setup. **Social Network Landscape :** Concept and UX on social networks – Interactivity of social network – Content flow on social network – Interaction Pattern between users – Social Media as a two way channel.

Unit III:

Analytics Process: Analysis – Insight – Investigation beyond social analytics – Shaping a method – analysis cycle – Community Activity – Resources – Attention span – Dynamic cycles – Short Periods – Long Periods – Analyst Mindset – Instinctive Analyst. **Metrics:** Introduction – Default and custom metrics – Metrics Categories – Graph Types – Metric Capabilities – Metrics and Strategy – Estimated Metrics – Metrics and Tactics.

Unit IV:

Dashboards: Purpose and Objectives – Default Vs. Custom Dashboards – Linearity and order of metrics – Metrics Positioning and Correlation – Metric and dashboard layout – Graphic design – Data Integration dashboards. **Reports:** Elements of reporting – Reporting approaches and formats – Animation and effects in reporting – Stake holders and feedback – Reporting with teams.

Unit V:

Strategy: Strategy in social media analytics – Strategic planning – Data availability and data sources – Knowledge beyond social media – Tools and technology preparation – Team Preparation – Goals and objectives – Contingency plans – application of social media analytics strategy – Strategy and tactics – Evaluation of a strategic analytics cycle.

Case Studies :Targeting the audience using Facebook Analytics, Tracking profile analytics in LinkedIn, Analysis of Political Tweets, ROI Analytics using Facebook, Marketing Strategy in Pinterest.

Text Book

Alex Goncalves(2017). Social Media Analytics Strategy-Using Data to Optimize Business Performance. Alex Goncalves. APress

Reference Books

- 1. Ganis, Kohirkar (2016). Social media Analytics, IBM Press PTG, 1st Edition
- 2. Nancy Flynn (2012). The Social Media Hand book Policies, and Best Practices, Wiley

Pedagogy: Lectures, Demonstrations, Group Discussions, Case studies

(11 Hrs)

(11 Hrs)

(11Hrs)

23PDAE08	CUSTOMER ANALYTICS	Category	L	Т	Р	Credit
		Theory	56	4	-	4

This course introduces the fundamental concepts of Customer data analytics. The course also provides the ways to recognize customer life time value, enhance customer loyalty, develop and execute analytics plan on customer data.

Prerequisite

- Foundations of Data Science
- Big data framework

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the customer analytics and visualize the results	K2
CO2	Apply the concepts of analytics to make better decisions	К3
CO3	Analyse the issues in customer analytics	K4
CO4	Appraise various data types in customer analytics before formulation of strategies.	K5
CO5	Propose solutions for the various cases in customer analytics	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	М	М	Μ
CO2	S	S	М	М
CO3	S	М	S	М
CO4	S	S	S	М
CO5	S	S	М	М

S- Strong; M-Medium; L-Low

Syllabus

UNIT I:

Understanding Customer Analytics - Mining Data for Insights - Visualizing Your Results - Acquiring and Segmenting - Valuable Customers - Acquiring the Ideal Customer - Using Segmentation Techniques - Identifying Customer Preferences through Micro Segmentation

UNIT II:

(11 Hrs)

(11 Hrs)

Recognizing Customer Lifetime Value - Defining CLV - Looking at Best Practices for CLV - Getting Started with Predictive Modeling - Personalizing Cross-Sells and Upsells

UNIT III:

Enhancing Customer Loyalty and Retention - Coping with Customer Churn - Increasing Customer Retention - Operationalizing Analytics to Make Better Decisions - Growing Customer Loyalty and Advocacy - Extracting Value Out of Social Media - Seeing Social Analytics in Action - Employing Sentiment Analysis - Incorporating All Data Types

UNIT IV:

Ten Key Ways to Get Started with Customer Analytics - Start with the Strategic End in Mind - Ask the Right Questions - Clarify Your Objectives - Choose Your Success Metrics - Secure Leadership and IT Buy-in Before You Start - Get the Right People for the Job -Evaluate Your Data - Pick the Right Tools to Complete the Project - Develop Your Analytics Plan - Execute

UNIT V:

Customer Analytics: 4 Phase Process – Case study: Card Pioneer Micro insurance Data Analysis. Use Cases: Call Center Audio Analysis, Precision Medicine, Churn Prediction using Telecom database

Text Book

- 1. Stephanie Diamond and Marygrace Bateman, Customer Analytics For Dummies, John Wiley & Sons, 2013
- CGAP team : Yanina Seltzer, Lisa Stahl, and Gerhard Coetzee, "Customer Analytics ToolKit,
 Content of the second seco

Customer Centricity Through Analytics ", CGPA 2017

Reference Books

- 1. Customer Analytics with R, Gitbook.
- 2. Customer Analytics for Dummies , Jeff Sauro, John Wiley & sons 2015

Pedagogy: Lectures, Demonstrations, Group Discussions, Case studies

(11 Hrs)

(**12 Hrs**) in

(11 Hrs)

ELECTIVE-V

	BUGINESS ANAL VEICS	Category	L	Т	Р	Credit
23PDAE09	DUSINESS ANAL I TICS	Theory	30	-	-	2

Preamble

Retail Analytics are elaborated in this course. Few Use cases are also covered.

Prerequisite

- Foundations of Data Science
- Big data framework

Course Outcomes

Upon successful completion of this course, students should be able to:

CO	CO Statement	Knowledge
Number		Level
CO1.	Compare various domain areas and their challenges	K2
CO2.	Apply the concepts of analytics to make better decisions	K3
CO3.	Examine use cases for different domains.	K4
	Evaluate the challenges faced in various domains and choose appropriate	K5
CO4.	analytics solutions in all domains	
CO5.	Propose suitable analytics solutions as required by the use cases.	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	Μ	Μ	Μ
CO2.	S	Μ	Μ	Μ
CO3.	S	S	Μ	Μ
CO4.	S	Μ	S	Μ
CO5.	S	S	S	Μ

S- Strong; M-Medium; L-Low

Syllabus

 $Health care\ analytics\ -\ Introduction\ -\ Potential\ contributions\ -\ Challenges\ of\ health care\ industry\ -$

current and future state of healthcare analytics - top healthcare analytics adaptations

UNIT II

Hrs)

(6

This

Banking and Finance: Systems of Banking – Commercial Banking – New Financial Services:Overview of Analytics in Insurance: Key Insurance Analytics – Challenges – Health Insurance Analytics, Life Insurance Analytics- Types of Insurance – Housing Finance.

UNIT III

(6 Hrs)

Telecommunication: Introduction - End-User Needs and Demands- Telecom Business

UNIT IV

(6 Hrs)

(6 Hrs)

Retail analytics – Understanding the new consumer – Marketing in a consumerdriven era-Managing the brand to drive loyalty

UNIT V

Case studies: Walmart, Netflix, Facebook, Uber, Amazon, Kaggle

Reference Books

- 2. Dwight McNeill(2013). A Framework for Applying Analytics in Healthcare: What Can Be Learned from Best Practices in Banking, Retail, Politics and Sports, Pearson Education
- 3. Gomez Clifford(2011). Banking and Finance Theory Law and practice, PHI Learning
- 4. Patricia L.Saporito(2014). Applied Insurance Analytics: A Framework for Driving More Value from Data Assets, Technologies and Tools, Pearson Education LTD.
- 5. Anders Olsson(2004). Understanding Changing Telecommunications, Wiley Publications
- 6. Jennifer LeClaire, Danielle Dahlstrom, Vivian Braun. Business analytics in Retail for dummies, 2 nd IBM Limited edition
- 7. Alistair Croll (2013) Lean analytics: Use Data to Build a Better Startup faster, O Reilly Publishers
- 8. Bernard Marr (2016). Big Data in Practice How 45 successful companies used big data analytics to deliver extraordinary results, Wiley Publications
- 9. Purba Halady Rao (2013). Business Analytics. An application Focus, PHI Learning private ltd.

Pedagogy : Lectures, Group Discussions, Demonstrations, Case studies

23PDAE10	MARKETING ANALYTICS	Category	L	Т	Р	Credit	
		Theory	56	4	-	4	

Prerequisite

Foundations of Data science

Course Outcomes

On successful completion of the course, the students will be able to

CO	CO Statement	Knowledge
Number		Level
CO1	Understand the concepts of marketing data and effective use of Microsoft Excel	К2
CO2	Apply Forecasting Techniques to improve response rates for marketing campaigns	К3
CO3	Analyse Market segmentation based on Cluster Analysis	K4
CO4	Estimate methods for processing marketing data in prediction and market segmentation.	К5
CO5	rmulate solutions in excel for various use cases of marketing analytics methods,	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	М	L	М
CO2	S	L	L	Μ
CO3	S	S	L	М
CO4	М	М	S	М
CO5	S	М	М	М

S- Strong; M-Medium; L-Low

Syllabus

Marketing Data Summarization - Slicing and Dicing Marketing Data with Pivot Tables - Using Excel

Charts to Summarize Marketing Data - Using Excel Functions to Summarize Marketing Data.

UNIT II

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.

UNIT III

(11 Hrs)

UNIT

70

(12 Hrs)

This c

Customer Needs: Conjoint Analysis - Logistic Regression - Discrete Choice Analysis - Customer Value

- Introduction to Customer value, Benefits

UNIT IV

(11 Hrs)

Market segmentation: Cluster Analysis - User-Based Collaborative Filtering - Collaborative Filtering - Using Classification Trees for Segmentation.

UNIT V

(11 Hrs)

Retailing and market research tools : Retailing - Introduction to retailing, Market Basket Analysis and Lift - Marketing Research Tools - Principal Components Analysis

Text Book

1. Wayne.L.Winston (2014). Marketing Analytics: Data driven techniques with MS-Excel, Wiley Publications

Reference Books

- 1. Stephan Sorger(2013). Marketing Analytics: Strategic models and metrics, CreateSpaceIndependent Publishing Platform
- 2. Chuck Hemann, Ken Burbary(2013). Digital Marketing Analytics, Pearson Publication

Pedagogy: Lectures, Demonstrations, Group Discussions, Case studies

ELECTIVE VI

23PDAE11	IOT ANALYTICS	Category	L	Т	Р	Credit
		Theory	56	4	-	4

Preamble

learning to the IOT data. The course also covers the organization of the IOT data, cost benefits of using IOT and review of IOT in various sectors.

Prerequisite

- Foundations of Data Science
- Basics of IOT

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand IOT Data Analytics, lifecycle, IOT based geospatial analytics and machine learning application in IOT	K2
CO2	Apply IOT concepts in Geospatial analytics and Machine learning	К3
CO3	Examine concepts of cloud based IOT, Big data and IOT in various domains.	K4
CO4	Appraise techniques and strategies for data collection with reference to big data.	K5
CO5	Propose strategies for organization of IOT data and optimize cost benefits in using IOT data.	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	М	М	М
CO2	S	S	М	М
CO3	S	S	S	М
CO4	S	S	S	М
CO5	S	S	S	М

S- Strong; M-Medium; L-Low

The co
Syllabus

Unit I

Introducing IOT Analytics : Introduction – IOT Data and Big Data – Challenges of IOT analytics.

Applications – IOT analytics Lifecycle and Techniques. IOT Cloud and Big Data Integration – Cloud based IOT platform – Data Analytics for IOT – Data Collection – WAZIUP software Platform – Ikaas Software Platform. Searching the Internet of things: Introduction – Search architectures for social and physical sensors – local Event Retrieval – Use of Sensor meta data streams.

Unit II:

IOT Devices and Networking Protocols: IOT devices in different domains. IOT Analytics for the Cloud – Building elastic analytics – elastic analytics concepts – designing for scale – Cloud security and analytics – AWS overview - AWS key services for IOT analytics. Thingworx overview . Creating an AWS Cloud Analytics environment.

Unit III

Strategies and Techniques in Data collection : Designing data processing for analytics – Applying big data to storage – Apache Spark for IOT data processing. Exploring IOT Data: Explore and visualize data – Tableau – Attribute identification – Solving industry specific problems

Unit IV

Geospatial Analytics to IOT Data : Basics – Vector and Raster based methods – Processing geospatial data. Data Science for IOT analytics – Machine learning basic – Forecasting IOT data using ARIMA – Deep learning with IOT data.

Unit V

Organize IOT data – Linked analytics datasets – Managing data lakes – data retention strategy for IOT data. Economics of IOT data – Cloud computing and open source – cost considerations – Revenue – Predictive maintenance. IOT review : IOT data flow – IOT exploratory analytics – IOT data science – Building revenue – Sample project.

Use Cases: Real time data analysis for manufacturing sector, IOT analytics for healthcare game changer.

Text Book

Andrew Minteer (2017). Analytics for the Internet of things. Packt Publishing.

Reference Books

- 1. Prasant Kumar Pattnaik, Raghvendra Kumar, Souvik Pal, S. N. Panda (2020) .IOT and Analytics in Agriculture. Springer.
- 2. John Soldatos(Editor). Building blocks for IOT Analytics:Internet-of-Things Analytics. River Publisher Series in Signal Image and Speech Processing.

(12Hrs)

(11Hrs)

(11Hrs)

(11Hrs)

(11Hrs)

Preamble:

The course covers an overview of implementation of Analytics and AI strategies in Business and provide details of disruption and transformation brought in various domains like Banking, Healthcare and Life sciences, Retail and Exponential technologies

Prerequisite

- Basic Knowledge of Analytics and Artificial Intelligence
- Knowledge in different domains

Course outcomes:

Upon the successful completion of the course, student will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the need of Analytics and AI strategy in	K)
	BusinessTransformation	K2
CO2.	Apply Analytics and AI strategy in different domains	K3
CO3.	Analyse mitigation of Fraud and customer retention using AI in different	K4
	domains	
CO4.	Assess the behavior of different cyber threats and attacks	K5

Mapping with programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	М	М	М
CO2.	S	М	М	М
CO3.	S	М	М	М
CO4.	S	S	М	М

Syllabus

UNIT I

Analytics and AI Strategy for Business Transfer:Re-engineering Business to think AI and Analytics – Robust Data Monetization Strategy – Accelerated Decision-making with Real-Time Analytics – Analytics as a Service Model – Analytics-Led Enterprise Transformation.

UNIT II

Banking Industry Transformed by Analytics and AI :Redefining Banking Industry – AI powered Financial services – Fraud Mitigation through AI – Reorienting Customer Retention and Risk Management – Advantage of AI in Fintech Companies – AI-Driven Transformations in Insurance – Adopting Digital Based Insurance Model.

UNIT III

Redefining Healthcare and Life Sciences :AI adoption in Healthcare – Real-world Evidence Based Analytics improving Treatment outcomes – Leveraging Patient and Drug similarity Analytics – AI : A Boon to the Life Science Industry – Analytics and Genomics.

UNIT IV

Analytics and AI in Retail :AI-powered shopping experience – Emergence of Smart Consumers – Recommendation Engines for Personalizing Experiences – Evolution of Smart Retailers – Omnichannel Experiences – Fluid Supply Chain Transformation.

UNIT V

(11 Hrs)

Exponential Technologies underpinned by Analytics and AI :Beating Cyberattacks with Analytics – Connected Car Technology reshaping Automotive Industry – IoT Analytics – Cryptocurrency Analytics – Chatbots – Redefining the Talent Landscape.

Text Book

Sameer Dhanrajani, "AI and Analytics- Accelerating Business Decisions", Wiley, 2018.

Reference Books

- 1. Stuart Russel and Peter Norvig, "Artificial Intelligence A Modern Approach", Pearson Education Press 2011.
- 2. Kevin Knight, Elaine Rich, B. Nair, "Artificial Intelligence", McGraw Hill, 2008.
- George F. Luger, "Artificial Intelligence", Pearson Education, 2001.Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Morgan Kaffman, 2002. Pedagogy:

Lectures, Case Analysis, Group Discussions, Demonstrations

(11 Hrs)

(11 Hrs)

(11 Hrs)

(12 Hrs)

EXTRA DISCIPLINARY COURSE

List of **Extra Disciplinary Courses** (Non-Major Electives) offered to other PG programmes

Course code	23PDAED01	PRINCIPLES OF INFORMATION TECHNOLOGY	L	Т	Р	С		
Core/Elective/S	Supportive	Supportive	4			4		
Course Objectives:								
The main obje	ctives of this c	course are to:						
1. To learn	1. To learn the basic concept and skills associated with information technology							
2. To know	v the Compute	r hardware and software technologies						
3. To gain	the knowledge	e of organizing data						
4. To asses	ss the current r	ole of Information Science in an organization						
5. To unde	erstand how IT	relates to organizational goals						
Expected Cou	irse Outcome	S:						
On the succe	essful complet	ion of the course, student will be able to:			1			
¹ Understar	nd the basics o	f information technology			K1,I	<u>K2</u>		
² Gain the k	knowledge of I	Hardware and Software technologies			ł	K2		
³ Learn the	method of org	ganizing data			K3,I	ζ4		
⁴ Assess the	e role of Inform	nation Science to an organization.			I	ζ5		
5 Understar	nding the role of	of IT in organizations			K5,I	Χ6		
K1 - Remen	nber; K2 - Uno	derstand; K3 - Apply; K4 - Analyze; K5 - Evalu	ate; K	6 - Cr	reate			
	I	Unite1			12 ha			
		Omt:1		-	12 110	urs		
Business Enviro about informati Modern Organi	onment: Busin on technology zation	ess and Information technology – business in the –what is an information system– Information Te	e inforn chnolo	matio ogy in	n age- 1 the	-		
	Unit:2 12 ho							
Computer Hard Computer Hier History and Si	lware – Signif archy – Input ignificance–Sy	Ticance of Hardware – Central Processing Unit- Technologies – Output Technologies. Compu- ystem Software–Application Software–Softwar	– Com ter So e issu	puter ftwar es–Pr	Mem e: Sof ogran	ory – tware iming		
languages-Ente	erprise Softwar	Te.	<u> </u>		17 ha			
1	1	UIIII:3	1		1⊿ NO	urs		

Managing Organizational Data and Information: Basics of Data arrangement and Access – Traditional file environment – modern approach: database management systems – logical data models – data warehouses – Networks– Internet- Evolution of the Internet –Operation of the Internet– WWW-Intranets and Extranets.

Unit:4

12 hours

Functional, Enterprises, and Inter organizational Systems: Information system to support business functions – transaction processing information systems – accounting and finance system – marketing and sales system – production and operations management system –Integrated information system and enterprises resource planning–inter organizational/Global information system. –Electronic Commerce

Unit:5

10 hours

Information Systems Development: Information system planning–Traditional systems development life cycle – alternative methods for system development –system development outside the IS department – building Internet and Intranet applications –Implementing: Ethics, Impacts and Security.

Unit:6Contemporary Issues2 hoursExpert lectures, online seminars – webinars

Total Lecture hours

60 hours

Text Books

1 Turban, Rainer, Potter "Introduction to Information Technology," Second edition, Wiley India, 2007.

Reference Books

1 V. Rajaraman, "Introduction to Information Technology, "Prentice Hall of India, 2007

Mappin	g with P	rogramn	ning Out	comes						
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	М	S	S
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S
CO5	S	S	S	S	S	S	S	М	S	S

Course code 23PE	DAED02	FUNDAMENTALS OF COMPUTERS AND COMMUNICATIONS	L	Т	Р	С		
Core/Elective/Suppo	rtive	Supportive	4			4		
Course Objectives:	Course Objectives:							
The main objectives	s of this c	ourse are to:						
1. Know the bas	sics of Co	omputers						
2. Learn the inte	2. Learn the internal Components of Computers							
3. Understand the	ne OS and	d its types						
4. Study the bas	ics of net	works and Internet						
5. Get a clear id	ea on DB	BMS and its concepts						
Expected Course C	Outcomes	:						
On the successful	complet	ion of the course, student will be able to:						
1 Know the b	basics and	l internal parts of Computers			K1,I	Κ2		
2 Gain the kn	nowledge	on OS and its types			I	Κ2		
³ Understand	the basi	cs of networks and Internet			K3,I	ζ4		
4 Learn the d	atabases	and DBMS concepts			ł	ζ5		
5 Understand	the role	of RDBMS in IT			K5,I	ζ6		
K1 - Remember;	K2 - Unc	derstand; K3 - Apply; K4 - Analyze; K5 - Evalu	ate; K	6 - Cr	eate			
		Unit:1]	12 ho	urs		
Introduction: What i using computers – systems. The Compo Computers and Device	is compute Compute onents of ces.	ter – Components of Computers – Advantages er Software – Categories of Computers - El the Systems Unit: Processor – Data representati	s and I ements on – N	Disad s of t Iemor	vantag inforn ry – N	ges of nation Iobile		
		Unit:2		1	12 ho	urs		
Input and Output Demouse – other point Reading devices Terr What is output – dis output device for phy	evice: Wi ting devi minals – splay dev ysically cl	hat is input – what are input devices – keyboa ces – Voice input –Digital Cameras – Video Biometric input - Input devices for physically cl ices – Monitors – Printers –Speakers, Headph hallenged users – Storage devices.	urd – p) input halleng ones a	oointin – Sc ged us nd Ea	ng dev canner ers-O ar pho	/ice – s and utput: ones –		
		Unit:3		1	12 ho	urs		
Operating Systems a functions – types of embedded operating Graphics and Multim	nd Utilit operating system. nedia Soft	y Programs: System software – Operating systems g systems – standalone operating systems–netwo Application Software: Application software tware–Application software for Communication	em – (ork ope – Busi	Opera erating iness	ting s g syste softw	ystem ems – 'are –		
		Unit:4]	l2 ho	urs		

Internet and World Wide Web: Internet – History of the Internet – How the Internet works –WWW– E-commerce–Communications and Networks: Communications – Uses of Computer Communications – Networks – Communication software – Communication devices – Communications Channel – Physical transmission media and Wireless transmission media.

Unit:5

10 hours

Database Management: Databases, Data and Information, The Hierarchy of data–Maintaining data – File processing versus databases – database management systems–relational, object oriented and multi dimensional databases – web databases – database administration. Computer Security: Computer security risks – Internet and network attacks –Unauthorized access and use.

Unit:6	Contemporary Issues	2 hours
Expert lectur	es, online seminars – webinars	

Total Lecture hours60 hours

Text Books

1 Gary B. Shelly, Thomasj. Cashman, Misty E.Vermaat, "Introduction to Computers,"Cengage Learning, 2008

Reference Books

1

- Reema Thareja, "Fundamentals of Computers", Oxford Univ. Press, 2015
- 2 Deborah Morley, Charles S.Parker, "Understanding Computers-Today and Tomorrow",14th Edition, Thomson Course Technology, 2012
- 3 Alexis Leon, Mathew's Leon, "Fundamentals of Computer Science and Communication Engineering", Vikas Publishing House, New Delhi, 1998.

Mappir	ng with P	rogramn	ning Out	comes						
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	М	S	S
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S
CO5	S	S	S	S	S	S	S	М	S	S

Course code	23PDAED03	E - COMMERCE	L	Т	Р	С	
Core/Elective/S	Supportive	Supportive	4			4	
Course Objec	tives:						
The main obje	ctives of this c	ourse are to:					
1. Know th	1. Know the mercantile and consumer process model						
2. Underst	2. Understand the Consumer's and Merchant's perspective						
3. Underst	and the Electro	onic payment system					
4. Earn an	in depth idea	on electronic data interchange					
5. Gain the	e knowledge o	n Internet, growth of internet and its commercial	uses				
Eurostad Cau	mas Outcome						
On the succe	essful complet	ion of the course, student will be able to:					
1 Learn	the introduction	on on a commerce			K1,F	K2	
2 Use and the introduction on e-commerce						<u>K</u> 2	
3 A networe the consumers and merchantle reprocess models					K3,ŀ	ζ4	
Analyse the consumers and merchant's perspective on e-commerce					ŀ	ζ5	
5 Gettin					K5.F	ζ6	
Gainii V1 Daman	ng the knowled	lge on Internet	atas V	C Cr	- ,	-	
KI - Kemen	nber; $\mathbf{K}\mathbf{Z}$ - Uno	ierstand; K3 - Apply; K4 - Analyze; K5 - Evalu	ate; K	b - Cr	eate		
		Unit:1		1	2 ho	urs	
Electronic Co	ommerce – E	lectronic Commerce Frame work – The Anato	omy of	f Elec	tronic	;	
Commerce	Applications -	Electronic Equipment Consumer Applications -		Elec	tronic	;	
Commerce O	rganization A	oplications - Components of I-Way – Network A	Access	Equip	ment.		
		Unit:2		1	2 ho	urs	
Architecture	Framework fo	r Electronic Commerce- World Wide Web as	the Ar	chitec	ture -	_	
Consumer Or	iented Applic	ations – Mercantile Process Models – Mercantil	e Mod	els fro	m the		
Consumer's I	Consumer's Perspective and Merchant's Perspective						
Consumer 5 reispective and merchant 5 reispective.							
		Unit:3		1	2 ho	urs	
Electronic Pa	yment Systen	ns: Types of Electronic Payment Systems – Di	gital T	oken	based	l	
Electronic Pa	Electronic Payment Systems–Smart Card and Credit Card Based Electronic Payment Systems						
– Risk and El	– Risk and Electronic Payment Systems – Designing Electronic Payment Systems.						

		Unit:4	12 hours				
Ele Pri Im	Electronic Data Interchange – EDI Applications in Business – EDI: Legal, Security and Privacy issues EDI and Electronic Commerce – Standardization and EDI – EDI Software Implementation.						
		Unit:5	10 hours				
Int Co	ternet and ommercial u	World Wide Web: origin of the Internet – New uses for the use of the Internet–Growth of the Internet – Advertising on the Internet	ne Internet – rnet.				
ι	J nit:6	Contemporary Issues	2 hours				
E	Expert lectur	res, online seminars – webinars					
Total Lecture hours 60 ho							
T	Text Books						
1 2	 Kalakota and Whinston, "Frontiers of Electronic Commerce", Pearson Education, 2004. Gray P.Scheider, "Fourth Annual Edition Electronic Commerce", Thomson Course Technology, 2003. 						
Re	eference Bo	ooks					
1	 Kamalesh K. Baja, Debjani Nag, "E-Commerce–The Cutting Edge of Business", TMH Publications, 2005. 						
2	Agar Com	Agarwala, K.N, Deeksha Agarwala, "Business on the Net: What's and How's of E-Commerce;" Macmillan, New Delhi.					
3	Parag Diwan, Sunil Sharma, "Electronic Commerce: A Manager's Guide to E- Business", Excel books, 2005.						

Mappir	ng with P	rogramn	ning Out	comes						
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	Μ	S	S
CO2	S	S	S	S	S	S	S	Μ	S	S
CO3	S	S	S	S	S	S	S	Μ	S	S
CO4	S	S	S	S	S	S	S	Μ	S	S
CO5	S	S	S	S	S	S	S	М	S	S

SKILL ENHANCEMENT COURSES LIST (SEC)

Cours code	e	23PDASP01	CLOUD COMPUTING LAB	L	Т	Р	С	
Core/H	Elective	e/Supportive	Supportive			3	2	
Pre	-requi	site	Basic Programming using Cloud					
Cours	e Obj	ectives:						
The m	ain ob	jectives of this c	course are to:					
1.Thi	1. This course covers the basic data structures like Stack, Queue, Tree, List.							
 2. The vario 3. It a 4. App 	 2. This course enables the students to learn the applications of the data structures using various techniques 3. It also enable the students to understand C++ language with respect to OOAD concepts 4. Application of OOPS concepts 							
Expec	ted Co	ourse Outcome	5 :					
Ont	the suc	ccessful complet	ion of the course, student will be able to:					
1	Unde	erstand the conce	epts of object oriented with respect to C++			K1,K2		
2	Able	to understand ar	d implement OOPS concepts			K3,K4		
3	Imple	mentation of dat	a structures like Stack, Queue, Tree, List us	sing C	++	K4,K5		
4	Applic differe	ation of the data nt techniques.	structures for Sorting, Searching using			K5,K6		
K1	- Rem	ember; K2 - Un	derstand; K3 - Apply; K4 - Analyze; K5 - E	valuat	e; K6	- Create		
						60 ha		
1. W	orking	with Google Dr	ive to make spreadsheet and notes.			00 110	uis	
2. La	unch a	a Linux Virtual N	Machine.					
3. To	host a	a static website						
4. Ex	xplorin dar, to	ng Google cloud o-do lists, d) a do	I for the following a) Storage b) Sharing becoment editing tool	of dat	a c) i	manage y	our	
5. W	5. Working and installation of Google App Engine							
6. W	6. Working and installation of Microsoft Azure							
7. To	7. To Connect Amazon Redshift with S3 bucket							
8. To	8. To Create and Query a NoSQL Table							
Exp	ert lec	tures, online ser	ninars – webinars					
					1			
			Total Lecture	e hour	S	60 ha	urs	

,	Text Books
1	Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009.
1	Anthony T. Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata McGraw Hill Education Private Limited, 2009.
R	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/courses/106/105/106105167/
2	https://www.tutorialspoint.com/cloud_computing/index.htm
3	https://www.javatpoint.com/cloud-computing-tutorial
	Reference Books

Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	Μ	S	S	S	Μ	Μ	S	S	
CO2	S	S	S	S	S	S	S	М	S	S	
CO3	S	S	S	S	S	S	S	М	S	S	
CO4	S	S	S	S	S	S	S	М	S	S	
CO5	S	S	S	S	S	S	S	М	S	S	

Course code	23PDASP02	DIGITAL IMAGE PROCESSING Using MATLAB	L	Т	Р	С				
Core/Elective/S	Supportive	Supportive			3	2				
Pre-requisit	te	Basic Programming of Image Processing & an intro to MATLAB				<u>.</u>				
Course Objectives:										
The main object	ctives of this co	urse are to:								
1.To understa image restora	1. To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques									
2. To enable t	the students to l	earn the fundamentals of image compression ar	nd segr	nent	tation					
3. To understa	and Image Rest	oration & Filtering Techniques								
4. Implement	ation of the abo	ve using MATLAB								
Expected Cou	rse Outcomes:	n of the course, student will be able to:								
1 To write	e programs in N	IATLAB for image processing using the techni	anes		K1 K	2				
2 To able	to implement I	mage Enhancements & Restoration techniques	ques		K1,K2 K2 K3					
3 Capable	e of using Com	pression techniques in an Image			K3,K4	4				
4 Must b	e able to manip	ulate the image and Segment it			K5,K	6				
K1 - Remen	nber; K2 - Unde	erstand; K3 - Apply; K4 - Analyze; K5 - Evalua	ate; K	6 - 0	Create					
	T				60 ha					
1. Implemer	nt Image enhance	ementTechnique.			00 110	<u>u15</u>				
2. Histogram	n Equalization	1								
3. ImageRes	storation.									
4. Implemen	nt ImageFilterin	g.								
5. Edge dete	ection using Op	erators (Roberts, Prewitts and Sobelsoperators)								
6. Implemer	nt image compre	ession.								
7. Image Su	7. Image Subtraction									
8. Boundary Extraction using morphology.										
9. Image Se	9. Image Segmentation									
		Total Lecture hou	rs		60 ho	ours				
Torit De al										
1 Defect C										

	PHI/Pearson Education.								
2	B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.								
Re	Reference Books								
1	Nick Efford, "Digital Image Processing a practical introducing using Java", Pearson								
1	Education, 2004.								
R	celated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]								
1	https://nptel.ac.in/courses/117/105/117105135/								
2	https://www.tutorialspoint.com/dip/index.htm								
3	https://www.javatpoint.com/digital-image-processing-tutorial								

Mapping with Programming Outcomes

The print is the state of the s											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	М	S	S	S	М	М	S	S	
CO2	S	S	S	S	S	S	S	М	S	S	
CO3	S	S	S	S	S	S	S	М	S	S	
CO4	S	S	S	S	S	S	S	М	S	S	
CO5	S	S	S	S	S	S	S	M	S	S	

Professional Competency Skill Enhancement Course

Cours	se code 23PDAPC01 Soft Skill Development Lab				Т	Р	С		
Core/	Core/Elective/Supportive Supportive								
Cours	Course Objectives:								
The m	ain obje	ctives of this co	urse are to:						
1.	To ena	ble students to	gain basic communication skills in profe	ssiona	l and	social con	texts		
2	To accu	ely. uire useful word	s and apply them in situational contaxt						
2.	To deve	elop listening a	and reading skills through comprehension n	assage	S				
4.	To enri	ich the leadershi	p qualities and interpersonal communicati	on					
5.	To enha	ance essential c	haracteristics in writing						
Expec	cted Cou	rse Outcomes:							
Ont	the succe	essful completio	n of the course, student will be able to:						
1 I	1 Improves the professional communication skills								
2 A	2 Apply useful words in the correct situation								
3 I	3 Improves the listening and reading skills								
4 A	4 Acquire the leadership qualities								
5 I	5 Improves the writing ability								
K1	- Remen	nber; K2 - Unde	rstand; K3 - Apply; K4 - Analyze; K5 - E	valuat	e; K6	- Create			
1	Charact	mistics of Tash	EXERCISES			75 ho	urs		
1.	Dovelor	mont of Employ	achility Skills						
2.	Vocabul	lary Developme	addincy Skills						
<u></u> З. Д	Sentence	e Completion	int						
5	Frror Sn	otting							
6	Interpret	tation of Verbal	Analogy						
	Interpret	tation of Readin	g (Comprehension -Conception)						
8	8 Interpretation of Reading (Comprehension - Conception)								
9.	9. Practice for writing E-mails/Technical Blogs/Forums								
10.	PPT Pre	paration / Demo	Instration of Technical Presentation						
11.	Preparat	ion of Resume							
12.	Preparat	tion for Job Inte	rviews / Mock Interview Section						

13. Group Discussion Skills

14. Developing Listening Skill(Comprehension)

- 15. Practice for Short Speeches / Situational Conversation
- 16. English through Mass Media
- 17. Essential Grammar
- 18. Communicating and collaborating with peer members
- 19. Team Empowerment

20. Persuasive Communication

Expert lectures, online seminars – webinars

Text Books

- **1.** Uma Narula, "Development Communication: Theory and Practice", Revised Edition, Har-Aanad Publication, 2019.
- **2.** Annette Capel and Wendy Sharp, "Cambridge English: Objective First", Fourth Edition, Cambridge University Press, 2013.
- **3.** Emma Sue-Prince, "The Advantage: The 7 Soft Skills You Need to Stay One Step Ahead", First Edition, FT Press, 2013.
- **4.** Guy Brook-Hart, "Cambridge English: Business Benchmark", Second Edition, Cambridge University Press, 2014.
- 5. Norman Lewis, "How to Read Better & Faster", Binny Publishing House, NewDelhi, 1978.

Reference Books

- **1.** Michael McCarthy and Felicity O'Dell, "English Vocabulary in Use:100 Units of Vocabulary Reference and Practice", Cambridge UniversityPress,1996.
- 2. Murphy, Raymond, "Intermediate English Grammar", Second Edition, Cambridge University Press, 1999.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	L	М	S	S	S	S	-
CO2	S	М	S	S	S	М	S	S	S	-
CO3	S	S	S	S	S	S	S	S	S	-
CO4	S	М	М	S	М	L	S	S	S	-
CO5	М	S	М	L	S	М	S	S	S	-

Mapping with Programme Outcomes

Course code	23PDAPC02	Data Visualization Lab	L	Т	Р	С				
Core/Elective/	Supportive			3	2					
Course Objec	•									
The main obje	The main objectives of this course are to:									
1. To lear	n the basic func	tions and operations of Excel and tableau								
2. To exp	lore to design,	build, and deploy various charts for application	ations	,						
3. To com	nprehend, design	n and deploy the label and heat map								
4. To und	lerstand and dep	loy dashboard								
5. To und	lerstand the func	ctions of tableau for data process.								
Expected Cou	irse Outcomes:									
On the succe	essful completio	on of the course, student will be able to:								
1 Enable to processing	b create and a	apply Spread sheet and Tableau for v	arious	data	K1-K	.6				
2 Gains kno Tableau.	2 Gains knowledge to create and design various visualization tools in Excel and K1- Tableau.									
3 Comprehe	end, create and	deploy labels and heat map.			K1-K	.6				
4 Enable to	create and appl	y dashboard for various data processing			K1-K	.6				
5 Illustrate	5 Illustrate and apply data visualization tool for any data set K1-K6									
K1 - Remen	K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create									
	LIST OF PROGRAMS									

Note: Use the following Dataset http://www.tableau.com/sites/default/files/training/global_superstore.zip Implement the following using Excel

- 1. Create Pie chart for Sales and Sales % by Country (sorted in descending order)
- 2. Create Bar chart for Sales by Country by Year (rounded to nearest thousand and sorted by Grand Total)
- 3. Create Line char for Sales by Ship Mode (First Class, Same Day, Second Class and Standard Class)
- 4. Create Scatter chart for Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class)
- 5. Create heat map for Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order)
- 6. Design and create the label for vendor list
- 7. Design and create the dash board

Implement the following using Tableau

- 8. Sales by Ship Mode (First Class, Same Day, Second Class and Standard Class)
- 9. Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class)
- 10. Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order)

Expert lectures, online seminars - webinars

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	L	М	S	-	-	-	-
CO2	S	М	S	S	S	М	-	-	-	-
CO3	S	S	S	S	S	S	-	-	-	-
CO4	S	М	М	S	М	L	-	-	-	-
CO5	М	S	М	L	S	М	-	-	-	-

Mapping with Programme Outcomes

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