Department of Data Science (UG)

Programme Specific Outcomes (PSOs)

On the successful completion of the Undergraduate programme, the students will be able to

PSO1 **Disciplinary Knowledge**	design, implement and apply computational skills related to Data Science along with practical industrial tools.
PSO2 **Communication Skills**	communicate and confidently share ideas related to Data Science terms in a clear and concise manner at different levels.
PSO3 **Problem Solving**	acquire knowledge to comprehend and derive solutions for various simple and complex problems using computer algorithms.
PSO4 **Analytical Reasoning**	apply the knowledge of Analytics, Statistics and learning concepts to solve real world business problems.
PSO5 **Research Skills**	equip themselves to cultivate logical thinking for conducting research, engage in continuous learning, and foster ethical collaboration within diverse multidisciplinary teams.
PSO6 **Digital Literacy**	utilize modern computing tools and techniques to find optimum solution for the betterment of society.
PSO7 **Leadership and Teamwork**	cultivate leadership quality, team work skill and professional ethics in the field of Data Science.
PSO8 **Moral and Ethical Awareness/Reasoning**	understand the moral and ethical guidelines that allow harmonious development in diverse environment.
PSO9 **Multicultural Competence**	collaborate, communicate, and lead effectively in multicultural environments in Data Science projects, embracing the richness of cultural diversity.
PSO10 **Self-directed & Lifelong Learning**	acquire academic competence and adapt to dynamic Data Science contexts, fostering a commitment to lifelong learning and growth.

Department of Data Science (UG)

Learning Outcome Based Curriculum Framework (LOCF)
(w.e.f 2024-2025)

Sem	Part	Course Code	Course Title	Hours/ Wk	Credits	Marks
1	I	24XXXNNNN	Tamil/Hindi/French	3	2	30
1	II	24XXXNNNN	English	3	2	30
1	III CC	24DSC1501	Relational Database Management System	5	5	75
1	III CC	24DSC1403	RDBMS Lab using ORACLE	4	4	60
1	III CC	24DSC1405	Programming in C	4	4	60
1	III S	24XXXNNNN	*Offered by Physics*	5	4	60
1	IVNME	24XXXNNNN	*Non Major Elective – I*	3	2	30
1	IVAEC	24HVS1200 / 24CHR1200	Human Values Development / Christian Studies	3	2	30
1	V	24XXXNNNN	NSS/NCC/PED/SLP/GMP/ GNS/LIB/ACH	-	-	-
	Total			**30**	**25**	**375**
2	I	24XXXNNNN	Tamil/Hindi/French	3	2	30
2	II	24XXXNNNN	English	3	2	30
2	III CC	24DSC1502	Object Oriented Programming with Java	5	5	75
2	III CC	24DSC1404	Object Oriented Programming with Java LAB	4	4	60
2	III CC	24DSC1406	Fundamental of Data Science	4	4	60
2	III S	24XXXNNNN	*Offered by Mathematics*	5	4	60
2	IVNME	24XXXNNNN	*Non Major Elective – II*	3	2	30
2	IVSEC	24DSC1200	Environmental Studies	3	2	30
2	V	24XXXNNNN	NSS/NCC/PED/SLP/GMP/ GNS/LIB/ACH	-	1	15
	Total			**30**	**25+1**	**375+15**
3	I	24XXXNNNN	Tamil/Hindi/French	3	2	30
3	II	24XXXNNNN	English	3	2	30
3	III CC	24DSC2401	Data Structures and Algorithms	4	4	60
3	III CC	24DSC2403	Data Structures and Algorithms Lab	4	4	60
3	III CC	24DSC2405	IOT and Cloud Technologies	4	4	60
3	III CC	24DSC2407	Data mining and warehousing	4	4	60
3	III S	24XXXNNNN	*Offered by Mathematics*	5	4	60
3	IV SEC	24XXXNNNN	*Skill Enhancement Course I*	3	2	30
3	V	24XXXNNNN	NSS/NCC/PED/SLP/GMP/ GNS/LIB/ACH	-	-	-
	Total			**30**	**26**	**390**
4	I	24XXXNNNN	Tamil/Hindi/French	3	2	30
4	II	24XXXNNNN	English	3	2	30
4	III CC	24DSC2402	Python Programming	4	4	60
4	III CC	24DSC2404	Python Programming Lab	4	4	60
4	III CC	24DSC2406	Artificial Intelligence	4	4	60

4	III CC	24DSC2408	Computer Networks	4	4	60
4	III S	24XXXNNNN	*Offered by Mathematics*	5	4	60
4	IV SEC	24XXXNNNN	*Skill Enhancement Course II*	3	2	30
4	V	24XXXNNNN	NSS/NCC/PED/SLP/GMP/ GNS/LIB/ACH	-	1	15
	Total			**30**	**26+1**	**390+15**
5	III CC	24DSC3601	Machine learning	6	6	90
5	III CC	24DSC3603	Machine learning Lab	6	6	90
5	III CC	24DSC3605	Natural Language Processing	6	6	90
5	III DSE	24XXXNNNN	*Discipline Specific Elective-I*	5	4	60
5	III GE	24XXXNNNN	*Generic Elective – I*	4	3	45
5	IV IS	24DSC3255	Internship*	-	2	30
5	IV SEC	24XXXNNNN	*Skill Enhancement Course –III*	3	2	30
	Total			**30**	**29**	**435**
6	III CC	24DSC3602	R Programming	6	6	90
6	III CC	24DSC3604	Mobile Application Development	6	6	90
6	III CC	24DSC3606	Project	6	6	90
6	III DSE	24XXXNNNN	*Discipline Specific Elective-II*	5	4	60
6	III GE	24XXXNNNN	*Generic Elective – II*	4	3	45
6	IV SEC	24DSC3266	Professional Competency Skill	3	2	30
	Total			**30**	**27**	**405**
Grand Total				**180**		**2370+30**

* Internship - Second Year Vacation (30 Hours)

Part III

Discipline Specific Elective (DSE)

Sem.	Part	Course Code	Course Title	Hours/Wk.	Credits	Marks
5	III	24DSC3407 / 24DSC3409	Big Data Analytics Reinforcement Learning	5	4	60
6	III	24DSC3408 / 24DSC3410	Marketing Analytics Analytics for Service Industry	5	4	60

Generic Elective (GE)

Sem.	Part	Course Code	Course Title	Hours/Wk.	Credits	Marks
5	III	24DSC3301 / 24DSC3303	Data Visualization Graph Database	4	3	45
6	III	24DSC3302 / 24DSC3304	Shell Programming Web Programming	4	3	45

Part IV

Non-Major Electives (NME)

Sem.	Part	Course Code	Course Title	Hours/Wk	Credits	Marks
1	IV	24DSC1201	Data Science for Beginners	3	2	30
2	IV	24DSC1202	Data Analysis using Spread Sheet	3	2	30

Skill Enhancement Courses (SEC)

Sem.	Part	Course Code	Course Title	Hours/Wk.	Credits	Marks
3	IV	24DSC2201	Tools for Data Science	3	2	30
4	IV	24DSC2202	Data Analysis using Power BI	3	2	30
5	IV	24DSC3201	NoSQL using MongoDB	3	2	30

Mapping with Pos

DSC	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
	3	3	3	3	2	2	2	2	2	2

Mapping of Courses with PSOs

Courses	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
24DSC1501	3	2	2	3	2	1	2	2	1	3
24DSC1403	3	2	2	3	2	1	2	2	1	3
24DSC1405	3	3	1	3	3	1	1	1	1	2
24DSC1502	3	3	1	3	3	1	1	1	1	2
24DSC1404	3	3	1	3	3	1	1	1	1	2
24DSC1406	3	3	1	3	3	1	1	1	1	2
24DSC1200	3	3	1	1	1	1	2	2	1	2
24DSC2401	3	3	3	3	2	3	2	1	3	2
24DSC2403	3	3	2	2	2	3	2	3	2	2
24DSC2405	3	3	3	3	3	3	2	1	2	2
24DSC2407	3	3	2	2	2	3	2	1	3	2
24DSC2402	3	3	2	3	2	1	2	1	1	1
24DSC2404	3	3	2	3	2	3	2	3	1	3
24DSC2406	3	3	3	2	3	3	2	1	3	2
24DSC2408	3	3	3	3	2	3	2	3	2	2
24DSC3601	3	3	2	3	2	3	2	1	3	2
24DSC3603	3	3	2	3	2	3	2	3	2	3
24DSC3605	3	3	2	3	2	3	2	2	3	2
24DSC3255	3	3	3	3	3	3	2	2	2	2
24DSC3407 24DSC3409	3	3	3	3	2	2	3	2	2	2
24DSC3602	3	3	2	3	2	1	3	2	3	1
24DSC3604	3	3	3	3	3	3	3	1	2	2
24DSC3606	3	3	3	3	3	3	2	2	2	2
24DSC3408 24DSC3410	3	3	2	3	2	2	3	2	3	2
24DSC3266	3	3	3	3	3	3	2	2	1	1
Average	**3**	**2.9**	**2.1**	**2.8**	**2.3**	**2.2**	**2**	**1.7**	**1.9**	**2.1**

Mapping of Courses with POs

Courses	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
24DSC1201	3	2	2	3	1	1	2	2	1	3
24DSC1202	3	2	3	3	1	1	2	2	1	2
24DSC2201	3	3	3	3	3	2	2	2	2	3
24DSC2202	3	2	3	3	1	1	2	2	1	2
24DSC3301 24DSC3303	3	3	3	3	2	2	3	2	3	2
24DSC3201	3	3	3	3	3	3	2	2	2	2
24DSC3302 24DSC3304	3	3	3	3	3	3	2	2	2	2
Average	**3**	**2.5**	**2.8**	**3**	**1.9**	**1.8**	**2.1**	**2**	**1.7**	**2.2**

SYLLABUS

Semester – I

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC1501	Relational Database Management System	Core	5	5

The aim of this course is to learn the basic concept of Database with different database model in detail and also extensively covers the Normalization process, overview of Entity Relationship Model, Relational Database Design and Transaction concepts.

Course Outcomes:

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

CO1: learn the fundamentals of Data Models and Gain knowledge about Entity Relationship Model.

CO2: express the basic concepts of Relational Model.

CO3: gain knowledge on SQL.

CO4: gain an introductory knowledge about Sub query, PL/SQL.

CO5: understand the fundamental concepts of Exception Handling and Transactions.

Unit I:- **15 Hours**

Database System-Characteristics of Database Management Systems- Architecture of Database Management Systems-Database Models-System Development Life Cycle-Entity Relationship Model- E-R diagram – Entity Set – Relationship – Degree - Weak Entity Set - Relational algebra – Keys – Constrains – Unique, Not null, Default, Check.

Unit II: **15 Hours**

Structure of Relational Model-Types of keys. Relational Algebra: Unary operations-Set operations-Join operations. Normalization: Functional Dependency- First Normal form-Second Normal Form-Third Normal form- Boyce-Codd Normal Form-Fourth Normal Form.

Unit III: **15 Hours**

Introduction to SQL – DDL, DML, DCL, TCL – Data Types –SQL Operators – Set operations - Aggregate functions– SQL Sub Queries – Database Users - Referential integrity - Triggers – View– Cursor.

Unit IV : **15 Hours**

Procedures- Subquery: Scalar, Multiple and Correlated subquery. Joins: Inner and Outer joins-Introduction-PL/SQL Basic-Character Set- PL/SQL Structure-SQL Cursor-Subprograms-Functions-Procedures.

Unit V: **15 Hours**

Introduction-Predefined Exception-User Defined Exception – Triggers-Implicit and Explicit Cursors-Loops in Explicit Cursor. Transaction Concepts – ACID Properties – Transaction States – Schedules – Serializability – Concurrency Control.

Learning Resources:

Textbooks

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill Education, 7th Edition, 2019.
2. Pranab Kumar Das Gupta and P. Radha Krishnan**,** "Database Management System Oracle SQL and PL/SQL", PHI Learning Private Limited, Second Edition, 2013.

References

1. MukeshNegi, "Fundamental of Database Management System: Learn Essential Concepts of Database Systems", BPB Publications, 2019.
2. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill College Publications, 2015.

Websites

1. https://intellipaat.com/blog/tutorial/sql-tutorial/rdbms.
2. https://www.scaler.com/topics/dbms/relational-model-in-dbms/

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	3	2	1	2	2	1	3
CO 2	3	2	3	3	2	1	2	2	1	3
CO 3	3	2	3	3	3	1	2	2	1	3
CO 4	2	2	2	3	2	1	2	3	1	3
CO 5	3	2	2	3	2	1	2	3	1	2
Average	**2.8**	**2**	**2.4**	**3**	**2.2**	**1**	**2**	**2.4**	**1**	**2.8**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC1403	RDBMS Lab using ORACLE	Core	4	4

The aim of this course is to train the students to create database using Oracle for real time application.

Course Outcomes:

At the end of the course the student will be able to

CO1: develop database using SQL.

CO2: examine queries in SQL to retrieve any type of information from a data base.

CO3: classify various functions available in DML commands.

CO4: construct queries using DCL commands and join operations.

CO5: build procedure using PL/SQL.

Lab Components:

1. Creating database tables using DDL commands
2. Practical Based on Data Manipulation Language.
3. Practical Based on Implementing the Constraints.
4. i.eNULL and NOT NULL, Primary Key and Foreign Key Constraint, Unique, Check and Default Constraint.
5. Practical for Retrieving Data Using following clauses.
6. Simple select clause, Accessing specific data with Where, Ordered By, Distinct and Group By.
7. Practical Based on Aggregate Functions.
8. Practical Based on implementing all String functions.
9. Practical Based on implementing Date and Time Functions.
10. Practical Based on implementing use of union, intersection and difference.
11. Implement Sub Queries.
12. Implement JOIN operation.
13. Implement Control structure in PL/SQL
14. Implement Exception Handlers.
15. Implement Implicit Cursor, Explicit Cursor.
16. Implement Procedures, Functions and Triggers.

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	3	2	2	2	2	1	3
CO 2	3	2	2	3	2	2	2	2	1	3
CO 3	3	2	3	3	2	1	2	3	1	2
CO 4	3	2	3	3	2	1	2	3	1	3
CO 5	3	1	2	3	1	1	3	2	1	3
Average	**3**	**1.8**	**2.4**	**3**	**1.8**	**1.4**	**2.2**	**2.4**	**1**	**2.8**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC1405	Programming in C	Core	4	4

The aim of this course is to enable the student to understand the fundamental problem solving techniques of C Concepts. It also helps them to use advanced concepts of pointers to build an effective applications on their own.

Course Outcomes:

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

CO1: outline the fundamental concepts of C programming.

CO2: demonstrate the use of Control structures and Functions.

CO3: understand the basics of Structure, Union using array.

CO4: implement pointers using arrays.

CO5: analyse various file operations.

Unit I: **12 Hours**

Language Evaluation Criteria - Language design - Language Categories – Implementation-Methods – Programming Environments - Overview of C: History of C- Importance of C- Basic Structure of C Programs-Executing a C Program- Constants, Variables and Data types - Operators and Expressions - Managing Input and Output Operations.

Unit II: **12 Hours**

Decision Making and Looping - Arrays - Character Arrays and Strings - User Defined Functions-Elements of User Defined Functions- Definition of Functions- Return Values and their Types-Function Call- Function Declaration- Categories of Functions- Nesting of Functions-Recursion.

Unit III: **12 Hours**

Defining a Structure- Declaring Structure Variables Accessing Structure Members- Structure Initialization- Arrays of Structures- Arrays within Structures- Unions- Size of Structures.

Unit IV: **12 Hours**

Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables-Initializing of Pointer Variables- Accessing a Variable through its Pointer - Pointer Expressions-Pointer and Scale Factor- Pointer and Arrays- Pointers and Character Strings- Array of Pointers-Pointer as Function Arguments - Pointers to Functions

Unit V: **12 Hours**

Introduction- Defining and opening a file - closing a file –Copying a file Input/output and Error Handling on Files – Files using Pointers.

Learning Resources:

Text Books

1. Robert W. Sebesta, "Concepts of Programming Languages", Fourth Edition, Addison Wesley, 2012.
2. E. Balaguruswamy, "Programming in ANSI C" , Fifth Edition, Tata McGraw Hill Publications, 2010.

References

1. Ashok Kamthane, "Programming with ANSI & Turbo C", Pearson Education, 2009
2. Byron Gottfried, "Programming with C", Schaums Outline Series, Tata McGraw Hill Publications, 2010

Websites

1. http://www.tutorialspoint.com/cprogramming/
2. http://www.cprogramming.com/

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	1	3	3	1	1	1	1	2
CO 2	3	3	1	3	3	1	1	1	1	2
CO 3	3	3	1	3	3	1	1	1	1	2
CO 4	2	3	1	2	3	1	1	1	1	2
CO 5	3	3	1	3	3	1	1	1	1	2
Average	**2.8**	**3**	**1**	**2.8**	**3**	**1**	**1**	**1**	**1**	**2**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC1201	Data Science for Beginners	NME	3	2

The aim of this course to provides an outline of Data Science. It gives an overview of data and Data Science processes. On successful completion of this course the student will have knowledge about the Data Science and its application.

Course Outcomes:

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

CO1: understand the fundamental concepts of data and its types.

CO2: identify the various stages of DataScience.

CO3: determine the goal of data process.

CO4: analyse various data cleaning methods to clean collected data.

CO5: summarized at a models to suitable problem and findings.

Unit I: 9 Hours

Introduction: fact of data - Structured data - Unstructured data- Natural language - Machine-generated data -Graph-based or Network data- Audio, Image, and video – Streaming data.

Unit II: 9 Hours

The Data science process: Setting the research goal- Retrieving data-Data preparation-Data exploration-Data modeling or model building-Presentation and automation.

Unit III: 9 Hours

Defining research goals and creating a project charter: Spend time understanding the goals and context of your research - Create a project charter - Retrieving data .

Unit IV: CLEANING DATA 9 Hours

Cleansing, Integrating, and Transforming data: Cleansing data - Correct errors -Combining data from different data sources-Transforming data.

Unit V: 9 Hours

Exploratory Data Analysis: Build the models – Model and variable selection-Model execution-Model diagnostics and model comparison-Presenting findings and building applications.

Learning Resources:

Text Book

1.Davy Cielen, Arno D.B. Meysman, Mohamed Ali,“ Introducing Data Science”, Manning Publications Co, 2016.

Reference

1.Avrim Blum, John Hopcroft, and Ravindran Kannan. “Foundations of Data Science”, 2018 .

2. Chirag Shah,”A Hands on Introduction to Data Science” Cambridge University press,2020.

CO-PO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**
CO 1	**3**	**2**	**2**	**3**	**1**	**1**	**2**	**2**	**1**	**3**
CO 2	**3**	**2**	**2**	**3**	**1**	**1**	**2**	**2**	**1**	**3**
CO 3	**3**	**2**	**2**	**3**	**1**	**1**	**2**	**2**	**1**	**3**
CO 4	**3**	**2**	**2**	**3**	**1**	**1**	**2**	**2**	**1**	**3**
CO 5	**3**	**2**	**2**	**3**	**1**	**1**	**2**	**2**	**1**	**3**
Average	3	2	2	3	1	1	2	2	1	3

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC1502	Object Oriented Programming with Java	Core	5	5

The aim of this course is to enable the student to understand the fundamental techniques of java. It also helps them to use advanced concepts of java to build an application on their own. On successful completion of this course the student will have core knowledge of Java,

Course Outcomes:

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

CO1: demonstrate the syntax and semantics of java programming language and basic concepts of OOP.

CO2: gain knowledge about packages and Threads.

CO3: understand the concepts of File handling .

CO4: implementing Networking concept in Java.

CO5: design event driven GUI and web related applications using applets.

Unit I: 15 Hours

Introduction to Java-Features of Java-Object Oriented Concepts– Lexical Issues-Data Types – Variables – Arrays – Operators – Control Statements – Classes – Objects –Constructors – Overloading method – Access control – static and fixed methods – Inner classes –Inheritance-Overriding Methods-Using super-Abstract class.

Unit II: 15 Hours

Packages-Access Protection-Importing Packages-Interfaces-Exception Handling-Throw and Throws- Thread-Synchronization-Messaging- Runnable Interface-Inter thread communication-Deadlock-suspending, resuming and stopping threads-Multithreading.

Unit III: 15 Hours

I/O Streams-File Streams-String Objects-String Buffer-Char Array – Java Utilities-Collectionsinterface –Collection classes-Enumeration – String class.

Unit IV: 15 Hours

Networking –Networking basics – java and the Net – InetAddress- TCP/IP Client Sockets –URL- URLConnection – TCP/IP Server Sockets – Datagram.

Unit V: **15 Hours**

Working with windows using AWT Classes – Class Hierarchy of Window and Panel –AWT controls – Layout Managers – Menus- Menu bars - Dialog Boxes- File Dialog- Applets-Lifecycle of Applet-Types of Applets-Event handling-Applet tags - JDBC and connecting to Databases.

Learning Resources:

Text Books

1.P.Naughton and H.Schildt, "Java 2 (The Complete Reference) ",Tata MCGraw Hill Edition, Third Edition, 1999.

2.K.K. Aggarwal &Yogesh Sing ,"Software Engineering ", , New Age International Publishers, Revised Third Edition, 2008.

References

1.Cay S. Horstmann, Gary Cornell, "Core Java 2", Volume I, Fundamentals- Ninth Edition Addision Wesley, 2012.

2.K.Arnold and J.Gosling, "The Java Programming Language", ACM Press/Addison- Wesley Publishing Co. New York, Second Edition.

Websites

1.https://www.w3schools.com/java/java_oop.asp#:.

2.https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/.

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PS010
CO 1	3	3	1	3	3	1	1	1	1	2
CO 2	3	3	1	3	3	1	1	1	1	2
CO 3	3	3	1	3	3	1	1	1	1	2
CO 4	2	3	1	2	3	1	1	1	1	2
CO 5	3	3	1	3	3	1	1	1	1	2
Average	**2.8**	**3**	**1**	**2.8**	**3**	**1**	**1**	**1**	**1**	**2**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC1404	Object Oriented Programming with Java Lab	Core	4	4

The aim of this course is to enable the student to understand the fundamental techniques of java. It also helps them to use advanced concepts of java to build an application on their own.

Course Outcomes:

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

CO1: implement simple OOPs concept in Java programs.

CO2: build elementary modifications in Java to solve real-world applications.

CO3: gain knowledge to create an application using string concept.

CO4: analyze various file operations.

CO5: understand the concepts of Applet to create an application.

Lab Components:

1. Implement Class and Object using Constructor.
2. Program using Command-Line Arguments.
3. Program using Random Class.
4. Program using Vectors.
5. Program using String Tokenizer Class.
6. Program using Interface.
7. Program using all forms of Inheritance.
8. Program using String class, String Buffer class.
9. Program using Exception Handling.
10. Implementing Thread based applications
11. Program using Packages.
12. Program using Files.
13. Working with Colours and Fonts.
14. Parameter passing technique.
15. Drawing various shapes using Graphical statements.
16. Usage of AWT components and Listener in suitable applications.

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	1	3	3	1	1	1	1	2
CO 2	3	3	1	3	3	1	1	1	1	2
CO 3	3	3	1	3	3	1	1	1	1	2
CO 4	2	3	1	2	3	1	1	1	1	2
CO 5	3	3	1	3	3	1	1	1	1	2
Average	**2.8**	**3**	**1**	**2.8**	**3**	**1**	**1**	**1**	**1**	**2**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC1406	Fundamental of Data Science	Core	4	4

The aim of this course provides an outline of Data Science and Python fundamentals. It gives an overview of Data Science process and its manipulations. On successful completion of this course the student will have knowledge about the data science and its application.

Course Outcomes:

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

CO1: understand the basic concepts of Data Science and its application.

CO2: identify the process of Data Science and understand the fundamental concepts of Python.

CO3: understand Python Functions and Modules.

CO4: analyze various File Concepts.

CO5: design a Database and build Data Visualization using Matplotlib.

Unit I: **12 Hours**

Introduction to Data Science Introduction: Data Science - Big Data and Data Science hype – getting past the hype – Datafication - Current landscape of perspectives - Skill sets needed - Statistical Inference - Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA – Applications of Data Science - Data Science in Business - Business Intelligence vs Data Science – Data Analytics Life Cycle - Machine Learning.

Unit II: **12 Hours**

The data science process- Setting the research goal- Retrieving data-Data preparation-Data exploration-Data model in go model building-Presentation and automation- Fundamentals of Python –Control Structures-Collections.

Unit III: **12 Hours**

Function Definition - Function Calling - Function Arguments - Anonymous Functions (Lambda Functions) - Recursive Functions - Modules and Packages: Built-in Modules - Creating Modules - import Statement- Namespaces and Scope - The dir() function - The reload() function - Packages in Python - Date and Time Modules – Numpy Libraries and Data Manipulation Using Pandas.

Unit IV: **12 Hours**

File Handling - Opening a File-Closing a File - Writing to a File - Reading from a File - File Methods - Renaming a File - Deleting a File - Directories in Python. Exception Handling.

Unit V: **12 Hours**

Database and Visualizations Connecting to a Database - Creating Tables - INSERT Operation - UPDATE Operation - DELETE Operation - READ Operation - Transaction Control - Disconnecting from a Database - Exception Handling in Databases - Data Visualizations using Matplotlib – histograms, bar charts, pie charts.

Learning Resources:

Text Books

1. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Front line",O'Reilly, 2014.
2. Seema Acharya, Subhasini Chellappan, , "Big Data Analytics", Wileypublications,Second edition. 2018.

References

1. LjubomirPerkovic,"Introduction to Computing Using Python: An Application Development Focus",John Wiley & Sons 2012.
2. John V Guttag," Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press 2013.

CO-PSO Mapping

Strong - 3 **Medium-2** **Low-1**

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	1	3	3	1	1	1	1	2
CO 2	3	3	1	3	3	1	1	1	1	2
CO 3	3	3	1	3	3	1	1	1	1	2
CO 4	2	3	1	2	3	1	1	1	1	2
CO 5	3	3	1	3	3	1	1	1	1	2
Average	**2.8**	**3**	**1**	**2.8**	**3**	**1**	**1**	**1**	**1**	**2**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC1202	Data Analysis using Spread Sheet	NME	3	2

The aim of this course is to understand the basic of Spread Sheet, Formulas, Functions, Charts and presentation techniques to maximize impact. On successful completion of this course the student will have knowledge about Data Analysis .

Course Outcomes:

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

CO1: describes the basics of the spread sheet and Tables.

CO2: understand the basic Formulas and Functions in Excel.

CO3: gain knowledge about Pivot table and to consolidate data.

CO4: develop macros and understand importance of Data Validation.

CO5: express the different types of Charts in Excel.

Unit I: 9 Hours

Introduction to Excel – Understanding Workbooks and Worksheets – Moving around Worksheet – Using Ribbon – Creating First Excel Workbook – Data Types – Entering Text, Values, Date and Time into Workbook – Modifying Cell Contents – Applying Number Formatting – Basic Worksheet operations.

Unit II: 9 Hours

Formulas Basics – Entering formula in Worksheet – Editing Formulas – Using Cell Reference in Formulas – Adding comments to cells – Working to Tables- Formulas in Tables – Calculating Percentage – Rounding Numbers – Counting values in a Range .

Unit III: 9 Hours

Working with Text – Using Text Functions – Excels Date and Time Functions - Creating a PivotTable - Specifying PivotTable Data - Changing a PivotTable's Calculation - Filtering and Sorting a PivotTable - Working with PivotTable Layout - Updating a PivotTable - Formatting a PivotTable - Creating a Pivot Chart .

Unit IV: **9 Hours**

Using the If…Then…Else Statement - Importing Data – Cleaning up Data – Exporting Data – Data Validation – Validation Criteria- Working with Macros - Recording a Macro - Playing and Deleting a Macro - Adding a Macro to the Quick Access Toolbar – Scenario Manager.

Unit V : **9 Hours**

What is a Chart – Creating a Chart – Modifying and Customizing Charts – Chart Types – New Chart Types - Selecting Chart Elements – Modifying Chart Area and Plot Area – Title in Chart – Legends – Gridlines – Axes – Working with Data Series.

Learning Resources:

Textbook

1. John Walkenbach, Michael Alexander, and Richard Kusleika, "Excel 2019 Bible", John Wiley & Sons, 2019.

References

1. PaulMcFedries, "Microsoft Excel 2019 Formulas and Functions", Microsoft Press, 2019.
2. ShmuelOluwa, "Hands-On Financial Modeling with Microsoft Excel 2019: Build practical models for forecasting, valuation, trading, and growth analysis using Excel 2019", Packt Publishing Ltd, 2019.

Websites

1. https://www.exceldemy.com/what-is-spreadsheet-in-ms-excel/
2. https://www.wallstreetmojo.com/basic-excel-formulas

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	3	3	1	1	2	2	1	2
CO 2	3	2	3	3	1	1	2	2	1	2
CO 3	3	2	3	3	1	1	2	2	1	2
CO 4	3	2	3	3	1	1	2	2	1	2
CO 5	3	2	3	3	1	1	2	2	1	2
Average	**3**	**2**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**2**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC1200	Environmental Studies	AEC	3	2

The aim of this course is to create awareness about the important of environment, the effect of technology on the environment and ecological balance and make student sensitive to the environment problems in every Professional endeavour that student participates.

Course Outcomes:

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

CO1: register the importance of environment and need for biodiversity.

CO2: classify the roles of an individual in prevention of pollution.

CO3: realize the roles of an individual in conservation of natural resources.

CO4: value the role of information technology in environment and human health.

CO5: evaluate the liability of non-governmental organization in environmental ethics.

Unit I: **9 Hours**

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – Introduction to biodiversity and ecosystem diversity – bio-geographical classification of India – value of biodiversity – Biodiversity at global, national and local levels.

Unit II: **9 Hours**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management– role of an individual in prevention of pollution – pollution case studies – disaster management.

Unit III: **9 Hours**

Forest resources - Water resources - Mineral resources-Food resources - Energy resources - Land resources - role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles.

Unit IV: **9 Hours**

From unsustainable to sustainable development – urban problems related to energy – resettlement and rehabilitation of people - role of NGO - environmental ethics – waste land reclamation – consumerism and waste products – environment production act – Forest conservation act.

Unit V: **9 Hours**

e-waste – toxic constituents – pollution problems – health impact of hazardous waste – reuse and recycling – collection process - separation process - e-waste recycling act and policy for India – Computer uses and impact on Health.

Learning Resources:

Text Book

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

References

1.R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol.I and II, Enviro Media,2010.

2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mum-bai, 2001.

CO-PO Mapping

	PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	1	1	1	1	3	2	1	2
CO 2	3	3	1	2	1	1	2	2	1	2
CO 3	3	3	1	1	1	1	3	2	1	2
CO 4	3	3	1	1	1	1	3	2	1	2
CO 5	3	3	1	1	1	1	3	2	1	2
Average	**3**	**3**	**1**	**1.2**	**1**	**1**	**2.2**	**2**	**1**	**2**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC2401	Data Structures and Algorithms	Core	4	4

The aim of this course is to understand the basic of Array, List, Queue, Charts and Trees Graph techniques to maximize impact.

Course Outcomes:
At the end of the course, students will be able to

CO1: understand the asymptotic notations and analysis of time and space Complexity.

CO2: understand the Concepts of Trees and Graphs Perform traversal.

CO3: apply searching and sorting techniques.

CO4: understand the concepts of Greedy Method and searching techniques.

CO5: understand the concept of shortest path algorithms.

Unit I: **12 Hours**

Abstract data types – asymptotic notations – complexity analysis- Linked lists: Singly linked list – doubly linked lists - Circular linked list, General lists- stacks – Queues – Circular Queues – Evaluation of expressions.

Unit II: **12 Hours**

Trees – Binary Trees – Binary Tree Traversal – Binary Tree Representations Binary Search Trees - threaded Binary Trees - Application of trees (Sets). Representation of Graphs – Graph implementation – graph Traversals - Minimum Cost Spanning Trees – Shortest Path Problems-Application of graphs.

UNIT III: **12 Hours**

Sorting – Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Selection Sort. Searching – Linear search, Binary search.

Unit IV: **12 Hours**

Greedy Method: Knapsack problem– Job Sequencing with deadlines – Optimal storage on tapes- Back Tracking.

Unit V: **12 Hours**

General method – Multistage Graph Forward Method– All pairs shortest path – Single source shortest path – Search Techniques for Graphs – DFS – Connected Components – Bi-Connected Components- Branch and Bound.

Textbooks

1. Seymour Lipshutz,"Schaum"s Outlines - Data Structures with C", Tata McGraw Hill publications,2011.

2. Ellis Horowitz and SartajSahni, Fundamentals of Computer Algorithms, Galgotia Publications Pvt., Ltd,2010.

References

1. Gregory L.Heileman, Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore, 1996.

2. A.V.Aho, J.D. Ullman, J.E.Hopcraf, "Data Structures and Algorithms", Addison Wesley Publication,2000.

Websites

1.https://www.tutorialspoint.com/data_structures_algorithms/index.htm

2.https://www.programiz.com/dsa

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8	PSO9	PSO10
CO 1	3	2	3	3	3	3	2	1	3	2
CO 2	3	3	3	3	3	3	2	1	3	2
CO 3	3	3	3	3	2	3	2	1	3	3
CO 4	3	3	2	3	2	3	2	1	3	2
CO 5	3	3	2	3	2	3	2	1	3	2
Average	**3**	**2.66**	**2.6**	**3**	**2.4**	**3**	**2**	**1**	**3**	**2.33**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC2403	Data Structures and Algorithms Lab	Core	4	4

To predict the performance of different algorithms in order to guide design decisions, provide theoretical estimation for the required resources of an algorithm to solve a specific computational problem

Course Outcomes:

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

CO1: understand the concepts of Linked List, Stack and Queue.

CO2: explain the concepts of Trees and Graphs. Perform traversal operations on Trees and Graphs.

CO3: apply searching and sorting techniques

CO4: determine the concepts of Greedy Method To apply searching techniques.

CO5: use File handlings in python, Concept of reading and writing files, Do programs using files.

Lab Components:

1. Perform stack operations.
2. Perform queue operations.
3. Perform Stack using linked list.
4. Infix to postfix conversion using stack.
5. Perform tree traversal operations.
6. Search an element in an array using linear search.
7. Search an element in an array using binary search
8. Sort the given set of elements using Merge Sort.
9. Sort the given set of elements using Quick sort.
10. Sort the given set of element using bubble sort.
11. Sort the given set of element using radix sort.
12. Search the Kth smallest element using Selection Sort.
13. Find the Optimal solution for the given Knapsack Problem using Greedy Method.
14. Find all pairs shortest path for the given Graph using Dynamic Programming method.
15. Find the Single source shortest path for the given Travelling Salesman problem using Dynamic Programming method.

16. Find all possible solution for an N Queen problem using backtracking method.
17. Find all possible Hamiltonian Cycle for the given graph using backtracking method.

Learning Resources:

Text books

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press, 2019

2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,"Fundamentals of Computer Algorithms " Universities Press, 2018

References

1. Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum's outline series in computers, Tata McGraw Hill, 2018

2. R.Krishnamoorthy and G.IndiraniKumaravel, Data Structures using C, Tata McGrawHill, 2008.

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	2	2	2	3	2	2
CO 2	3	3	2	2	2	3	2	3	2	2
CO 3	3	3	2	2	2	3	3	3	2	2
CO 4	3	3	2	2	2	3	2	3	2	2
CO 5	3	3	2	2	2	2	2	3	2	2
Average	**3**	**3**	**2**	**2**	**2**	**2.6**	**2.2**	**3**	**2**	**2**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC2405	IOT and Cloud Technologies	Core	4	4

The aim of this course is to allow access to large amounts of computing power virtually, and offering a single system view. The role of IoT is to generate massive amounts of data. Cloud computing provides a way to store IoT data and provides tools to create IoT applications.

Course Outcomes:

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

CO1: design an IOT system with cloud infrastructure.

CO2: implement Machine-to-Machine (M2M) communication protocols in a prototype.

CO3: describe the basic concepts of the main sensors used in electromechanical systems.

CO4: develop and implement computer models of common engineering information types.

CO5: explain storage mechanisms and apply analysis algorithms for data management in distributed and data-intensive applications.

Unit I: **12 Hours**

IoT Introduction: Introduction to IoT – IoT definition – Characteristics – IoT Complete Architectural Stack – IoT enabling Technologies – IoT Challenges. Sensors and Hardware for IoT – Hardware Platforms – Arduino, Raspberry Pi, Node MCU - Protocols for IoT.

Unit II: **12 Hours**

Introduction to Cloud Computing Cloud Computing – Definition – SPI Framework – Software Model – Cloud Services Delivery Model – Deployment Models – Key drivers – Impact on Users – Governance in the cloud – Barriers to Cloud Computing Adoption in the enterprise. Examples of Cloud Service Providers: Amazon Web services – Google – Microsoft Azure Services Platform – Sun Open Cloud Platform.

Unit III: **12 Hours**

Virtual Machines Provisioning and Migration Services Introduction and Inspiration -Background and Related Work- Virtual Machines Provisioning and Manageability-Virtual Machine Migration Services- VM Provisioning and Migration in Action -Provisioning in the Cloud Context - Future Research Directions- The Anatomy of Cloud Infrastructures -Distributed Management of Virtual Infrastructures- Scheduling Techniques for Advance Reservation of Capacity- Capacity Management to meet SLA Commitments.

Unit IV: **12 Hours**

Data Security, Identity and Access Management Data security and storage: Aspects of Data Security -Data Security Mitigation -Provider Data and Its Security. Identity and Access Management: Trust Boundaries and IAM -Why IAM? - IAM Challenges- IAM Definitions- IAM Architecture and Practice-Getting Ready for the Cloud - Relevant IAM Standards and Protocols for Cloud Services - IAM Practices in the Cloud-Cloud Authorization Management- Cloud Service Provider IAM Practice.

Unit V : **12 Hours**

Security and Privacy Security Management: Standards – Security Management in the Cloud – Availability Management – Access Control. Privacy: What is Privacy – Data Life Cycle – Key Privacy Concerns – Who is responsible for protecting Privacy – Privacy Risk Management – Legal and Regulatory Implications. IoT and Cloud Integration: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment.

Learning Resources:

Textbooks

1. Pethuru Raj and Anupama C. Raman,"The Internet of Things: Enabling Technologies, Platforms, and Use Cases",CRC Press.
2. Tim Mather, Subra Kumaraswamy, ShahedLatif, ”Cloud Security and Privacy”, OREILLY Media,2010.

References

1. Ronald L. Krutz and Russell Dean Vines, “Cloud Security”, Wiley – India,2010.

Websites

1. https://www.tutorialspoint.com/mobile_development_tutorials.htm
2. https://www.tutorialspoint.com/android/index.htm

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8	PSO9	PSO10
CO1	3	3	3	3	3	2	2	1	2	2
CO2	3	3	3	3	3	3	2	1	2	2
CO3	3	3	3	3	3	3	2	1	2	3
CO4	3	3	3	3	2	3	2	1	2	3
CO5	3	2	3	3	3	3	2	1	2	2
Average	**3**	**2.8**	**3**	**3**	**2.8**	**2.8**	**2**	**1**	**2**	**2.4**

Strong -3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC2407	Data Mining and Warehousing	Core	4	4

The aim of this course is to provide knowledge on Data Mining and Warehousing concepts and techniques.

Course Outcomes:

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

CO1: understand the fundamental concepts of data and its Modelling

CO2: determine to get an analytical idea on Classification.

CO3: gain knowledge of Cluster analysis and its methods.

CO4: analyze about Decision Tree.

CO5: summarize about Outlier with its applications.

Unit I: **12 Hours**

Data Warehousing:-Introduction- Definition-Multidimensional DataModel-OLAP operations-Warehouse Schema-Metadata-OLAP Engine-Data Warehouse Backend Process.Data Warehouse Model.DataMining:-Introduction-KDD vs DataMining-DBMS vs DM-DM Techniques-Applications and Issues in Data Mining. Challenges of DataMining Association Rule:-Introduction-Methods to Discover Association Rule- A priori algorithm- Partition Algorithm.

Unit II: **12 Hours**

Pincer –Search Algorithm- Dynamic Item search counting algorithm- Pattern Mining in Multilevel-Multidimensional Space. Classification-Basic Concepts-Decision Tree Induction-Bayes Classification Methods-Rule-Based Classification.

Unit III: **12 Hours**

Cluster Analysis-Basic Concepts – Types of Clustering-Partitioning Methods-Hierarchical Methods-Density-Based Methods-Evaluation of Clustering-Categorical Clustering algorithm. Advanced Cluster Analysis-Clustering High-Dimensional Data-Clustering Graph and Network Data.

Unit IV: **12 Hours**

Decision Tree:- Introduction-Tree construction Principle-Best split-splitting Indices-Splitting criteria-Decision tree construction algorithm-CART-ID3-C4.5-CHAID.

Unit V: **12 Hours**

Outlier Detection-Outlier Analysis-Outlier Detection Methods- Clustering-Based Approaches-Classification-Based Approaches. Data Mining Trends- Mining Complex Data Types-Case study on Data Mining Applications.

Learning Resources:

Textbook

1. Arun K.Pujari," Data Mining Techniques" ,University Press, Third Edition, 2013.
2. Jiwai Han and MichelineKamber , "Data Mining – Concepts and Techniques", Morgan Kaufmann Publishers ,3rd Edition ,2012.

References

1. Charu C. Aggarwal,"Data Mining ", Springer, 2015.
2. Tan, Steinbach, Kumar, "Introduction to Data Mining ", Pearson Education, 2014.

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8	PSO9	PSO10
CO 1	3	2	2	2	2	3	2	1	3	2
CO 2	3	3	2	2	2	3	2	1	3	2
CO 3	3	3	3	2	2	3	2	1	3	3
CO 4	3	3	2	3	2	3	2	1	3	2
CO 5	3	3	2	3	2	3	2	1	3	2
Average	**3**	**2.66**	**2.33**	**2.4**	**2**	**3**	**2**	**1**	**3**	**2.33**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC2201	Tools for Data Science	SEC	3	2

The aim of this course is to introduce students to the fundamental tools and techniques used in data science and to provide hands-on experience with data manipulation, analysis, and visualization tools.

Course Outcomes

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

CO1: describe the data science workflow and its components**.**

CO2: demonstrate proficiency in using various data manipulation and analysis tools.

CO3: apply statistical methods effectively to analyze data.

CO4: create visualizations using appropriate tools and techniques.

CO5: utilize big data tools and frameworks for data processing and analysis.

Unit I: 9 Hours

Overview of Data Science - Evolution and growth of Data Science-Data Science Workflow -Data Collection and Cleaning-Exploratory Data Analysis-Data Preparation-Model Building and Evaluation-Deployment and Monitoring.

Unit II : 9 Hours

Introduction to Data Manipulation and Analysis Tools-Statistical Analysis and Visualization Tools-Machine Learning Libraries-Version Control and Collaboration Tools-Cloud Computing Platforms.

Unit III : 9 Hours

Introduction to Data Visualization- Data Types and Visual Encodings Advanced Visualization Techniques - Tools and Libraries - Ethical Considerations and Visualization Ethics.

Unit IV : 9 Hours

Principles of effective data visualization: clarity, accuracy, efficiency, and engagement - Basic Charts and Graphs - Geographic and Spatial Visualizations - Interactive Dashboards - Design Principles and Storytelling.

Unit V : **9 Hours**

Introduction to Big Data - Introduction to Hadoop Ecosystem - Apache Spark-Spark for Big Data Processing -NoSQL Databases - Data Visualization and Exploration - Real-world Applications and Case Studies.

Learning Resources:

Textbooks

1. Jake VanderPlas, "Python Data Science Handbook", Second Edition**,**Published by O'Reilly Media,inc, 2018
2. Joel Grus, "Data Science from Scratch: First Principles with Python",Second Edition**,**Published by O'Reilly Media, inc., 2019

References

1. AurélienGéron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" Second Edition, Published by O'ReillyMedia,inc.
2. Nathan Marz and James Warren, "Big Data: Principles and best practices of scalable real-time data systems"**,**2015.

Websites

1. https://learning.linkedin.com/resources/learning-tech/how-to-use-13-essential-data-science-tools
2. https://www.geeksforgeeks.org/best-tools-and-technologies-for-data-science/

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	3	3	2	2	1
CO2	3	3	3	3	3	2	3	2	2	1
CO3	3	2	3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	3
CO5	3	3	3	3	3	2	2	2	2	3
Average	**3**	**2.6**	**3**	**3**	**3**	**2.6**	**2.4**	**2.2**	**2.2**	**2.2**

Strong -3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC2402	Python Programming	Core	4	4

The aim of this course is to teach the essentials of Python and trains the students to develop applications in Python.

Course Outcomes

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

CO1: acquire the basic knowledge of the fundamentals of Python.

CO2: understand Array, String and Functions concepts.

CO3: gain knowledge about List, Tuple and Dictionary.

CO4 : analyze about Files and Exception.

CO5: summarize about GUI with its applications.

Unit I: 12 Hours

Datatypes in Python: Built-in datatypes – bool datatype – sequences – sets – literals – characters – user-defined datatypes – constants – identifiers and reserved words – naming conventions. Operators in Python: Arithmetic – assignment – unary – relational – logical – Boolean – bitwise – membership – identity – operator precedence – mathematical functions. Input and Output: Output statements – input statements – command line arguments. Control statements-Arrays- Strings

Unit II: 12 Hours

Functions: Definition – calling a function – returning results and values – arguments – local and global variables – recursion. Packages- Basic packages- Machine learning Packages- Panda- Graphic packages.

Unit III: 12 Hours

Lists: Creating a List – updating the elements in lists – concatenation – repetition – membership –aliasing – finding the biggest and common elements – sorting. Tuples: Creating tuples – accessing the tuples – function to process tuples – inserting, modifying and deleting elements in tuples. Dictionaries: Operation in dictionaries – Converting lists and strings into dictionaries – Passing dictionaries to functions.

Unit IV: **12 Hours**

Files: Types – opening and closing a file – working with text and binary files – with statements – seek() and tell() methods. Exceptions: Errors in Python program – exceptions – exception handling – types of exceptions – except block – assert statement – user-defined exceptions.

Unit V: **12 Hours**

GUI: Tkinter package-create window and dialogbox-– Fonts and colors – Working with containers – canvas – frame – widgets – button – label – message – text scrollbar – check box – radio button – entry – spin box – list box – menu – creating tables

Learning Resources:

Textbook

1. Nageswara R. R., "Core Python Programming", Second Edition, Dreamtech Press, New Delhi, 2019.

References

1. Balagurusamy, "Introduction to Computing &Problem Solving Using Python", Mc Graw Hill Education, 2016.
2. Allen Downey,JeffreyElkner, Chris Meyers , "How to think like a computer scientist : learning with Python", 2012.

Websites

1. https://www.programiz.com/python-programming**.**
2. https://www.guru99.com/python-tutorials.html**.**

CO-PSO Mapping

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**
CO 1	3	2	2	3	2	1	2	2	1	2
CO 2	3	3	2	3	2	1	2	2	1	2
CO 3	3	3	3	3	2	1	2	2	1	2
CO 4	3	3	2	3	2	1	2	2	1	2
CO 5	3	3	2	3	2	1	2	2	1	2
Average	**3**	**2.66**	**2.33**	**3**	**2**	**1**	**2**	1	1	1

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC2404	Python Programming Lab	Core	4	4

The aim of this course is to train the students to develop problem-solving abilities and facilitate them to build the necessary skill set and analytical abilities for developing Python-based applications.

Course Outcomes:

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

CO1: construct programs using Control and Loop statements in Python

CO2: understand Array, String and Functions concepts.

CO3: build programs using List, Tuple and Dictionary.

CO4: construct programs to fix errors in the code and to read and write files in Python.

CO5: develop simple Python programs to demonstrate Exception Handling

Lab Components:

1. Implement Python script to show the usage of various operators available in python language
2. Write a Program to utilize Control statements
3. Write a program to use looping statements.
4. Working with arrays in Python.
5. Define a function to find the largest among 5 values.
6. Implement recursion to find the factorial of a number.
7. using the package calculate the area and volume of the cube and sphere
8. Use an ordered collection of items in a list to do following operations- Insert, count, sort, append, pop, Extend.
9. Create a tuple with different data type values to access, unpack, copy, concatenate, reverse and sort the data.
10. Implement file concept to do various operations in a file.
11. Utilize the Tkinter package to create a root window, label and buttons.
12. Write a python program to use geometry manager classes to display various shapes.

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**1**	**3**
CO 2	**3**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**1**	**3**
CO 3	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**1**	**3**
CO 4	**3**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**1**	**3**
CO 5	**3**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**1**	**3**
Average	**3**	**2.66**	**2.33**	**3**	**2**	**2.66**	**2.33**	**3**	**1**	**3**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC2406	Artificial Intelligence	Core	4	4

The aim of this course is to develop systems that can analyze large datasets, identify patterns, and make data-driven decisions. This ability to solve problems and make decisions efficiently is invaluable across various industries, from healthcare and finance to transportation and manufacturing.

Course Outcomes:

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

CO1: design user interfaces to improve real-time decision-making.

CO2: learn the methods of solving problems using Artificial Intelligence.

CO3: demonstrate awareness and a fundamental understanding of various applications of AI.

CO4: extract information and methods from natural language processing NLP.

CO5: develop robotic process automation to manage business processes.

Unit I: **12 Hours**

Introduction to Artificial Intelligence What is Artificial Intelligence? AI Technique, Representation of a problem as State space search, production systems, Problem characteristics, Production System characteristics – Issues in the design of search programs, Heuristic Search Techniques - Generate & Test Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means-End Analysis.

Unit II : **12 Hours**

Knowledge Representation- Approaches and issues in knowledge representation –Using Predicate Logic – Representing simple facts in logic – Representing Instance and ISA relationship – Computable functions and predicates – resolution – Natural deduction - Representing knowledge using rules –Procedural versus declarative knowledge – Logic programming - Forward versus backward reasoning – Matching – Control Knowledge - Symbolic reasoning under uncertainty - Logics for Nonmonotonic reasoning – Implementation Issues – Augmenting a problem solver – Implementation: Depth first search, Breadth first search.

Unit III: **12 Hours**

Statistical Reasoning Probability and Bayes‟ Theorem - Certainty factors and rule-based systems- Bayesian networks – Dempster - Shafer Theory - Weak slot-filler structure - Semantic nets – frames. Strong slot-filler structure- Conceptual dependency – Scripts – CYC – Syntatic – Semantic spectrum of Representation – Logic and slot-and-filler structure.

Unit IV: **12 Hours**

Game Playing, Planning & NLP Minimax search procedure-Adding alpha-beta cutoffs-Additional Refinements – Iterative Deepening – Reference on specific games Planning - Components of a Planning system – Goal stack planning – Nonlinear planning using constraint posting- Hierarchical planning – Reactive systems. Natural Language Processing - Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing – Statistical Natural Language processing.

Unit V: **12 Hours**

Learning & Advanced Topics in AI What is learning? – Rote learning – Learning by taking advice – Learning in problem solving – Learning from examples: Induction – Explanation based learning – Discovery – Analogy – Formal learning theory - Neural Net learning and Genetic learning.

Learning Resources:

Textbook

1. Elaine Rich, Kevin Knight, Shivsankar B Nair, ”Artificial Intelligence”, Tata McGraw Hill Publication, Third Edition, 2008.

References

1. Russel S, NorvigP, “Artificial Intelligence : A Modern approach”, Pearson Education Third Edition, 2010.
2. Dan W Patterson, “Introduction to Artificial Intelligence and Expert System”, Pearson Education Inc. Second Edition 2007**.**

Websites

1. https://www.ibm.com/topics/artificial-intelligence
2. https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8	PSO9	PSO10
CO1	3	3	3	3	3	3	2	1	3	2
CO2	3	3	3	2	2	3	2	1	3	2
CO3	3	2	2	2	3	3	2	1	3	3
CO4	3	3	3	3	3	3	2	1	3	2
CO5	3	3	3	2	2	3	2	1	3	2
Average	**3**	**2.8**	**2.8**	**2.4**	**2.6**	**3**	**2**	**1**	**3**	**2.2**

Strong -3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC2408	Computer Network	Core	4	4

The aim of this course is to introduce the fundamental network architecture concepts and their core principle issues in the emerging communication/data networks.

Course Outcomes:

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

CO1: understand the basics of data communication, networking, internet and their importance.

CO2: analyze the services and features of various protocol layers in data networks.

CO3: differentiate wired and wireless computer networks

CO4: analyze TCP/IP and their protocols.

CO5: recognize the different internet devices and their functions.

Unit I: **12 Hours**

Introduction– Networks – The Internet – Protocols and Standards- Network Models: OSI model – TCP/IP protocol suite – Transmission Media: Guided media – Unguided Media.

Unit II : **12 Hours**

Error Detection and Correction: Introduction- Block coding – Linear block codes – Cyclic Codes – Checksum. Framing – Flow and Error Control: Protocols –Noiseless Channels: Stop- and – Wait – Noisy Channel: Stop-and Wait Automatic Repeat Request-Go-Back –N.

Unit III : **12 Hours**

Multiple Access: Random Access – Controlled access- Channelization. Network LayerLogical addressing: IPv4 addresses – IPv6 addresses. Transport Layer: Process to Process delivery: UDP – TCP. Congestion Control – Quality of Service.

Unit IV: **12 Hours**

Domain Naming System: Name Space - Domain Name Space - Distribution of Name Space - DNS in the INTERNET - Resolution–Remote logging – E-mail – FTP.

Unit V: **12 Hours**

Introduction **to** Wireless Network– Principles and Fundamentals. WLANs – WPAN- Satellite Networks –Fixed Wireless Access System- Wireless ATM and Ad-hoc Routing – Personal Area Network(PANs).

Learning Resources:

Text books

1. Forouzan, A. Behrouz, "Data Communications & Networking", Fourth Edition, Tata McGraw Hill Education,2006.

2. Nicopolitidis, Petros, Mohammad SalamehObaidat, G. L. Papadimitriou," Wireless Networks", John Wiley & Sons,2018.

Reference Books

1. Fred Halsall, Data Communications Computer Networks and Open Systems, Fourth Edition, Addison Wesley,1996.

Websites

1.https://www.tutorialspoint.com/data_communication_computer_network/index.htm

2.https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	2	2	2	3	2	2
CO 2	3	3	3	3	2	3	2	3	2	2
CO 3	3	3	3	3	2	3	3	3	2	2
CO 4	3	3	3	3	2	3	2	3	2	2
CO 5	3	3	3	3	2	2	2	3	2	2
Average	**3**	**3**	**3**	**3**	**2**	**2.6**	**2.2**	**3**	**2**	**2**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC2202	Data Analysis using Power BI	SEC	3	2

This course aims to provide fundamental knowledge on Data analysis using the Power BI .

Course Outcomes:

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

CO1 : understand the basics of Data Explorations.

CO2: gain knowledge about prepare data for Analysis.

CO3 : study the basics of Power BI environment.

CO4 : explore the data modelling in the Power BI environment

CO5: apply various data visualization techniques and publish the report.

Unit I: **9 Hours**

Origin of Data :Concepts of Data-Methods of Data Collections-Validity and reliability of variables- Big data- Difference of traditional data and Big data-Sampling.

Unit II: **9 Hours**

Types of Variables-Types of Observation-Data tables-Datasets-Process of Data cleaning. Exploratory of Data Analysis-Frequencies-Probabilities-Distribution-statistics summary.

Unit III : **9 Hours**

Introduction to Power BI:Power BI Basics-Parts of Power BI-Power BI Flow-Building blocks of Power BI-Power BI desktop Interface-Power BI Components-Installing Power BI Desktop. Importing Dataset: Importing Data in Power BI Desktop-Variety of Data Importing -Load Data - Clean the Data-Dealing with errors-Data Transformation.

Unit IV: **9 Hours**

Exploring Data Model-Creating Relationships-Steps in Modelling Data. Query from CSV-Query Editor-Interface of Query Editor-Query Ribbon- Calculated Measures Using DAX. Building Report-Filtering the Data-Slicers-Edit Interface.

Unit V: **9 Hours**

Power BI Visualization: Visualization panel-Interacting Power BI Report-Changing the Data with slicers and filters-Navigating Power BI reports. Adding more Visuals and Exploring Interface-Adding a Report Title-Saving and Exporting: Saving as pbix file-Exporting and publishing as Report-Sharing the Report.

Learning Resources:

Textbook

1. Gabor Bekes , Gabor Kezdi, Data Analysis for Business and Economics and Policy, Cambridge University press,2021.
2. Brain Larson, Data analysis using Power BI ,MC Graw Hill,2020.

Reference

1. Tiffany Bergin, “An Introduction to Data Analysis Quantitative ,Qualitative and Mixed Methods”,SAGE,2018.

Websites

1. https://gabors-data-analysis.com/
2. https://monashdatafluency.github.io/Power_BI/powerbi-intro.pdf

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	3	3	1	1	2	2	1	2
CO 2	3	2	3	3	1	1	2	2	1	2
CO 3	3	2	3	3	1	1	2	2	1	2
CO 4	3	2	3	3	1	1	2	2	1	2
CO 5	3	2	3	3	1	1	2	2	1	2
Average	3	2	3	3	1	1	2	2	1	2

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3601	Machine Learning	Core	6	6

The aim of the course is to enable the students to learn the basic concepts and techniques of Machine Learning. It explores the knowledge about the Supervised and Unsupervised learning techniques.

Course Outcomes:

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

CO1: describe the basic concepts of Machine Learning

CO2: understand the Dimensionality Reduction methods

CO3: apply the clustering techniques

CO4: implement of Decision tree to solve a machine learning problem

CO5: analyze the Reinforcement learning method

Unit I : **18 Hours**

Machine Learning - Examples–Applications – Learning Associations - Classification -Regression - Unsupervised Learning - Reinforcement Learning – Supervised Learning**:** Learning a Class from Examples- Vapnik –Chervonenk is Dimension – Probably Approximately Correct Learning - Noise-Learning Multiple Classes .

Unit II : **18 Hours**

Introduction – Subset Selection – Principal Component Analysis – Feature Embedding-Factor Analysis–Singular Value Decomposition and Matrix Factorization - Multidimensional Scaling Linear Discriminate Analysis – Canonical Correlation Analysis- Isomap – Locally Linear Embedding- Laplacian Eigenmaps.

Unit III : **18 Hours**

Introduction – Mixture Densities *k*-Means - Clustering-Expectation – Maximization Algorithm-Mixtures of Latent Variable Models – Supervised Learning after Clustering - Spectral Clustering – Hierarchical Clustering – Choosing the Number of Clusters.

Unit IV : **18 Hours**

Introduction – Univariate Trees - Classification Trees - RegressionTrees – Pruning – Rule Extraction from Trees – Learning RulesfromData – Multivariate Trees

Unit V: **18 Hours**

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning. Reinforcement Learning Introduction – Single State Case - *K*-ArmedBandit – Elements of Reinforcement Learning.

LearningResources:

Textbook

1. Ethem Alpaydin, ”Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)”, Third Edition, MIT Press, 2014.

References

1. Stephen Marsland, “Machine Learning An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, “Machine Learning”, First Edition, McGraw Hill Education, 2013.

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8	PSO9	PSO10
CO 1	3	2	2	3	2	3	2	1	3	2
CO 2	3	3	2	3	2	3	2	1	3	2
CO 3	3	3	3	3	2	3	2	1	3	3
CO 4	3	3	2	3	2	3	2	1	3	2
CO 5	3	3	2	3	2	3	2	1	3	2
Average	**3**	**2.66**	**2.33**	**3**	**2**	**3**	**2**	**1**	**3**	**2.33**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3603	Machine Learning Lab	Core	6	6

The aim of this course is to train the student to implement Machine learning Techniques in real time applications Using Python /R programming.

Course Outcomes:

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

CO1: construct programs using classification, Clustering

CO2: implement K means KNN in real time applications.

CO3: build programs to utilize SVM , PCA.

CO4: construct programs to utilize Linear Regression and logistic regression.

CO5: develop programs to demonstrate Multi-lass classification, decision tree

Lab Components:

1. Write a R program to implement the naïve Bayesian classifier using students' data set
2. Frame a clusters to identify active users of library books using R libraries
3. Use K-Means Clustering to cluster the eligible person to avail education loan
4. Implement k-Nearest Neighbour algorithm to find nearest commercial place
5. Write a python program to implement Support Vector Machines
6. Reduce the dimension of an image using PCA
7. Write a python program to implement Linear Regression
8. Implement prediction techniques using Logistic Regression
9. Use Product sales details to implement Multi-Class Classification
10. Write a R program to prepare a decision tree using the medical data set

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	2	3	2	2	2	3	2	3
CO 2	3	3	2	3	2	3	2	3	2	3
CO 3	3	3	3	3	2	3	3	3	2	3
CO 4	3	3	2	3	2	3	2	3	2	3
CO 5	3	3	2	3	2	3	2	3	2	3
Average	**3**	**2.66**	**2.33**	**3**	**2**	**2.66**	**2.33**	**3**	**2**	**3**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3605	Natural Language Processing	Core	6	6

The aim of this course is to understand approaches to syntax and semantics in NLP.

Course Outcomes:

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

CO1: describe the fundamental concepts and techniques of natural language processing.

CO2: explore and gain a broad understanding of text data.

CO3: use NLP methods to analyse sentiment of a text document.

CO4: analyze large volume text data generated from a range of real-world applications.

CO5: develop robotic process automation to manage business applications.

Unit I: **18 Hours**

Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.

Unit II: **18 Hours**

Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.

Unit III: **18 Hours**

Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure.

Unit IV: **18 Hours**

Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages-Machine Translation Approaches-Translation involving Indian Languages.

Unit V: **18 Hours**

Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-Frame NetStemmers- POS Tagger- Research Corpora SSAS.

Learning Resources:

Textbooks

1. Daniel Jurafsky, James H. Martin, "Speech & language processing", Pearson publications.
2. Allen, James. Natural language understanding. Pearson, 1995.

Reference Book

1. Pierre M. Nugues, "An Introduction to Language Processing with Perl and Prolog",Springer.

Websites

1.https://en.wikipedia.org/wiki/Natural_language_processing.

2.https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP.

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8	PSO9	PSO10
CO 1	3	2	2	3	2	3	2	2	3	2
CO 2	3	3	2	3	2	3	2	2	3	2
CO 3	3	3	2	3	2	3	2	2	3	3
CO 4	3	3	2	3	2	2	2	2	3	2
CO 5	3	2	2	3	2	2	2	2	3	3
Average	**3**	**2.6**	**2**	**3**	**2**	**2.6**	**2**	**2**	**3**	**2.4**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3255	Internship	IS	-	2

The aim of this course is to allow a student to observe and participate in professional work environments and explore how his interests relate to possible careers. They are important learning opportunities through industry exposure and practices.

Course Outcomes:

At the end of the course, the student will be able to

CO1: identify how the internship relates to their academic courses and preferred career path.

CO2: integrate existing and new technical knowledge for industrial application.

CO3:design solutions to real time complex engineering problems using the concepts of Data Science through independent study.

CO4: demonstrate teamwork and leadership skills with professional ethics.

CO5: prepare an internship report in the prescribed format and demonstrate oral communication through presentation of the internship work.

CO-PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**
Average	3	2.8	3	2.6	2.6	2.8	2	2	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3407	Big Data Analytics	DSE	5	4

The aim of this course is to know the fundamental concepts of big data and analytics and explore tools and practices for working with Big data.

Course Outcomes:

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

CO1: understand Big Data and its analytics in the real world

CO2: design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm.

CO3: analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics.

CO4: design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics.

CO5: implement Big Data Activities using Hive.

Unit I : **15 Hours**

Big Data introduction - definition and taxonomy - Big data value for the enterprise - The Hadoop ecosystem - Introduction to Distributed computing- Hadoop ecosystem – Hadoop Distributed File System (HDFS) Architecture - HDFS commands for loading/getting data - Accessing HDFS through Java program.

Unit II: **15 Hours**

Introduction to Map Reduce frame work - Basic Map Reduce Programming: - Advanced Map Reduce programming: Basic template of the Map Reduce program, Word count problem- Streaming in Hadoop- Improving the performance using combiners- Chaining Map Reduce jobs- Joining data from different sources.

Unit III: **15 Hours**

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - Fundamentals of HBase and Zoo Keeper.

Unit IV: **15 Hours**

No SQL databases: Mongo DB: Introduction – Features - Data types - Mongo DB Query language - CRUD operations – Arrays - Functions: Count – Sort – Limit – Skip – Aggregate - Map Reduce. Cursors – Indexes - Mongo Import – Mongo Export.

Unit V: **15 Hours**

Introduction – Features - Data types – CQLSH - Key spaces - CRUD operations – Collections – Counter – TTL - Alter commands - Import and Export - Querying System tables.

Learning Resources:

Textbooks

1. J Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publication, 2015.

2. Dr. M. Davamani Christober, *Concepts of Data Science using R*, Kanthaga pookal pathipagam, 2021

Reference Books

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", John Wiley & Sons, Inc., 2013.

2. Tom White, "Hadoop: The Definitive Guide", O"Reilly Publications, 2011.

Websites

1. https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics

2. https://www.coursera.org/articles/big-data-analytics

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	2	3	2	1	3	2	2	1
CO 2	3	3	2	3	2	1	3	2	3	1
CO 3	3	3	3	3	2	1	3	3	3	1
CO 4	3	3	2	3	2	1	3	2	3	1
CO 5	3	3	2	3	2	1	3	2	3	1
Average	**3**	**2.66**	**2.33**	**3**	**2**	**1**	**3**	**2.33**	**2.66**	**1**

S-Strong-3 **M-Medium-2** **L-Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3409	Reinforcement Learning	DSE	5	5

The aim of this course is to learn the basic concept of Reinforcement Learning and Tabular Solution Methods. It gives an overview of Finite Markov Decision Process, Dynamic programming, Monte Carlo Methods , Planning and Learning.

Course Outcomes

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

CO1: describe the elements of reinforcement learning and tabular solution methods.

CO2: identify and classify the categories of finite Markov decision processes.

CO3: analyze dynamic programming methods for solving reinforcement learning problems.

CO4: solve problems using Monte Carlo methods for estimating value functions.

CO5: apply tabular methods in planning and learning scenarios.

Unit I: **15 Hours**

Reinforcement Learning – Examples - Elements – Limitations and Scope - An Extended Example: Tic-Tac-Toe - Tabular Solution Methods – An n-Armed Bandit Problem – action value methods – Incremental Implementation – tracking a Nonstationary Problem – Optimistic initial values – associative Search.

Unit II : **15 Hours**

The Agent – Environment Interface – goals and rewards – unified notation for episodic – Markov Property – Markov decision processes – value function – Optimal value functions – Optimality and Approximation.

Unit III : **15 Hours**

Policy Evaluation – Policy improvement – policy iteration – value iteration – Asynchronous Dynamic programming – Generalized policy iteration – efficiency of Dynamic programming.

Unit IV: **15 Hours**

Monte Carlo Prediction – Estimation of Action values – control – control without Exploring starts – Off Policy prediction – incremental implementation – off policy Monte carlo control – importance sampling on Truncated returns.

Unit V : **15 Hours**

Models and Planning – Integrating planning, Acting and Learning – When the model isWrong – Prioritized sweeping – trajectory Sampling – Heuristic Search – Monte carlo treesearch – Hands on using Python.

Learning Resources:

Textbook

1. Sutton R. S. and Barto A. G., "Reinforcement Learning: An Introduction"**,** MIT Press,2015.

References

1. SudharsanRavichandran, “Hands-On Reinforcement Learning with Python”, Packt Publishing,2018.
2. CsabaSzepesvári, “Algorithms for Reinforcement Learning”, Morgan & Claypool Publishers, 2016.
3. Phil Winder, “ Reinforcement Learning, O’ Reilly”, 2020.

Websites

1. https://www.geeksforgeeks.org/what-is-reinforcement-learning/
2. https://aws.amazon.com/what-is/reinforcement-learning/

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8	PSO9	PSO10
CO1	3	3	3	3	3	3	3	1	2	2
CO2	3	3	3	2	2	3	3	1	2	2
CO3	3	2	3	2	3	3	3	1	2	2
CO4	3	3	2	3	3	3	2	1	2	3
CO5	3	3	3	3	3	3	2	1	2	2
Average	**3**	**2.8**	**2.8**	**2.6**	**2.8**	**3**	**2.6**	**1**	**2**	**2.2**

S-Strong-3 **M-Medium-2** **L-Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3301	Data Visualization	GE	4	4

The aim of this course is to provide fundamental knowledge on Data Visualization using the Tableau tool.

Course Outcomes

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

CO1: understand the basics of Data Explorations.

CO2: understand the basic concepts of Data visualization.

CO3: study the linear and non-linear ways of Data visualization.

CO4: explore the data visualization using Tableau tool.

CO5: apply various data visualization techniques to prepare charts.

Unit I : 12 Hours

Introduction – Understanding data, Data Models, Visualization-the Medium, Representing Data, Exploring Data Visually, and Visualizing with Clarity, Designing for an Audience. The Value of Visualization - Record Information, Support Reasoning, Make a Decision, Data in Context, Find Patterns. Taxonomy of Data Types, Nominal, Ordinal & Quantitative, Dimensions & Measures, Data Tables & Transformations, Common Data Formats.

Unit II : 12 Hours

Basics of Data Visualization - The Seven Stages of Visualizing Data - Getting Started with Processing - Mapping - Time Series - Connections and Correlations - Scatterplot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs – Acquiring Data – Parsing Data.

Unit III : 12 Hours

Visualizing Data: Mapping Data onto Aesthetics – Visualizing Amounts - Visualizing Distributions: Histograms and Density Plots – Visualizing Propositions: – Visualizing Associations: Among Two or More Quantitative Variables – Visualizing Time Series and Other Functions of an Independent Variable – Trends – Visualizing Geospatial Data.

Unit IV: **12 Hours**

Tableau Software Ecosystem-Toolbar Icons- Data Window and Aggregation- Connect to Data-Sorting Data-Measure Names- Number of Records & Measures- Cross-tabulation- Tableaus Calculations & Filters Calculated Fields- Basic Approach to calculate rank Filter's : Introduction Top and Bottom filters- Context filter Slicing Filters -Data Sources Filters- Extract Filters.

Unit V: **12 Hours**

Tableaus Charts Types-Bar , Box, Bubble, Circle, Line, Pie, Scatter, Stacked, Tree, World Cloud, Waterfall. Filled-Crosstab- Combines- Motion-Heatmap- Tree maps, Bar Chart-Line Chart, Pie Chart, Scatter Plot, Histogram, Boxplot.

Learning Resources:

Textbooks

1. Nathan Yau, "Data points: visualization that means something", John Wiley & Sons, 2013.
2. JuusoKoponen, Jonatan Hildén, "Data Visualization Handbook", Aalto University publication, 2019.

References

1. Colin Ware, "Information Visualization: Perception for Design", Elsevier, 2013.
2. Kieran Healy, "Data Visualization: A Practical Introduction", Princeton University Press, 2018.

Websites

1. https://careerfoundry.com/en/tutorials/data-analytics-for-beginners/introduction-to-data-visualization.
2. https://www.datacamp.com/tutorial/data-visualisation-tableau.

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10
CO 1	3	2	2	2	2	1	3	2	2	1
CO 2	3	2	2	3	1	1	3	3	3	2
CO 3	2	3	3	3	2	2	2	3	3	1
CO 4	3	3	2	2	2	1	3	2	2	2
CO 5	2	3	2	3	1	1	1	2	3	1
Average	**2.6**	**2.6**	**2.2**	**2.2**	**1.6**	**1.4**	**2.4**	**2.4**	**2.6**	**1.4**

Strong -3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3303	Graph Database	GE	4	3

The aim of this course is to learn the basic concept of Graph Database with different database model in detail and also extensively covers the Graph Theory, Graph Algorithm, Graph Applications and Predicative Analysis with Graph Theory.

Course Outcomes:

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

CO1: learn the fundamentals of Graph Database and Gain knowledge about power of Graph Databases.

CO2: express the basic concepts of Graph Theory and Algorithms

CO3: gain knowledge on Data Modelling

CO4: gain an introductory knowledge about building Database Applications.

CO5: understand the fundamental concepts of Predictive Analysis with Graph Theory.

Unit I: **12 Hours**

What is Graph? – A High Level View of the Graph Space – Graph Database – Graph Compute Engines – The Power of Graph Databases – Performance - Flexibility – Agility – Options for Storing Connected Data – Relational Databases Lack Relationships – NOSQL Databases Lack Relationships.

Unit II : **12 Hours**

Graph Types and Structures – Flavors of Graphs – Connected Versus Disconnected Graphs – Unweighted Graphs Versus Weighted Graphs – Undirected Graphs Versus Directed Graphs – Acyclic Graphs Versus Cyclic Graphs – Sparse Graphs Versus Dense Graphs - Type of Graph Algorithms – Pathfinding – Centrality – Community Detection.

Unit III : **12 Hours**

Models and Goals – The Labeled Property Graph Model - Querying Graphs : An introduction to Cypher = Cypher Philosophy – MATCH – RETURN – A Comparison of Relational and Graph Modeling – Cross – Domain Models.

Unit IV : **12 Hours**

Data Modeling – Application Architecture – Embedded versus Server – Clustering – Load Balancing – Testing – Performance Testing – Capacity Planning – Optimization criteria – Performance – Redundancy - Load.

Unit V: **12 Hours**

Depth and Breadth First Search – Path Finding with Dijkstra's algorithm – The A* Algorithm – Graph Theory and Predictive Modelling – Triadic Closures - Structural Balance.

Learning Resources:

Text Books

1. Ian Robinson, Jim Webber & Emil Eifren, " Graph Database", O'REILLY, 2nd Edition, 2021.
2. Mark Needham & Amy E. Hodler**,** "Graph Algorithms ", O'REILLY , First Edition, 2019.

References

1. TomazBratanic, "Graph Algorrithm for Data Science", O'REILLY, 2023.

Websites

1. https://neo4j.com/docs/getting-started/get-started-with-neo4j/graph-database/
2. https://www.geeksforgeeks.org/what-is-graph-database/

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	3	3	2	2	1
CO2	3	3	3	3	3	2	3	2	2	1
CO3	3	2	3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	3
CO5	3	3	3	3	3	2	2	2	2	3
Average	**3**	**2.6**	**3**	**3**	**3**	**2.6**	**2.4**	**2.2**	**2.2**	**2.2**

Strong -3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3201	NOSQL Using MongoDb	SEC	3	2

The aim of this course is to Understand the differences between NoSQL and traditional relational databases and gaining a comprehensive understanding of MongoDB, a popular NoSQL database, including its architecture, key features, and advantages over traditional SQL databases.

Course Outcomes:

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

CO1:explain the core concepts of NoSQL databases and their differences from SQL.

CO2:identify and categorize various NoSQL database types

CO3:demonstrate in-depth knowledge of MongoDB, a leading document-oriented NoSQL database.

CO4:design, develop, and manage data models using MongoDB.

CO5:apply querying techniques for efficient data retrieval and manipulation in MongoDB.

Unit I : 9 Hours

Limitations of Relational Databases (SQL) -The Rise of NoSQL Databases-Key-Value Stores Document Stores-Column-Family Stores-Graph Databases-Choosing the Right NoSQL Database.

Unit II: 9 Hours

Introduction to MongoDB Architecture-Data Modeling with JSON Documents-Schemas vs. Schema less Design in MongoDB-CRUD Operations (Create, Read, Update, Delete)-Introduction to MongoDB Query Language (MQL).

Unit III : 9 Hours

Setting Up and Using MongoDB (Community Server) - Creating and Managing Databases and Collections - Inserting, Updating, and Deleting Documents -Performing Queries with MQL Operators -Logical Operators and Filtering Data -Projections and Excluding Fields

Sorting and Aggregation.

Unit IV : **9 Hours**

Indexing Strategies for Performance Optimization - Joins and Relationships between Documents - Data Replication and Sharding for Scalability - Security and User Management in MongoDB - Backup and Recovery Techniques.

Unit V : **9 Hours**

Building Web Applications with MongoDB - Real-world Use Cases of MongoDB-e-commerce, social media- Exploring MongoDB Development Tools and Languages.

Learning Resources

Textbooks

1.Pramod Sadalage, Martin Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", I Edition.

2.Shannon Bradshaw, Eoin Brazil, Kristina Chodorow, "MongoDB: The Definitive Guide - Powerful and Scalable Data Storage", III Edition (Greyscale Indian Edition) 2020.

References

1. C Balakrishnan, "Fundamentals of NoSQL", 2014.

2. Justin Jenkins , "MongoDB for Jobseekers: Reach new heights in your career with MongoDB", 2023.

Websites

1. https://www.geeksforgeeks.org/introduction-to-nosql/
2. https://www.oracle.com/in/database/nosql/what-is-nosql/

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	3	3	2	2	1
CO2	3	3	3	3	3	2	3	2	2	1
CO3	3	2	3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	3
CO5	3	3	3	3	3	2	2	2	2	3
Average	**3**	**2.6**	**3**	**3**	**3**	**2.6**	**2.4**	**2.2**	**2.2**	**2.2**

Strong -3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3602	R Programming	Core	6	6

The aim of this course is to provide a practical introduction to R programming language, the student will be comfortable operating in the R environment, including importing external data, manipulating data for specific needs, and running summary statistics and visualisations.

COURSE OUTCOMES:

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

CO1: explain the concept of R and data types

CO2: understand the concepts of various data structure in R

CO3: analyze the various control structures and function in R

CO4: compare and contrast the various statistical concepts

CO5: analyzing various data visualisation graph in R

Unit I: **18 Hours**

Overview of R, Basic features of R, Design of R system , Limitation of R, R Resource, data types, operators and objects.

Unit II: **18 Hours**

File handling-Reading and writing data, importing and exporting data, manipulating, data, Data Structure – Vector, matrix , list , Data Frames, Factors, Data and time.

Unit III: **18 Hours**

Control structures, functions, Loop functions , Scoping Rules of R, Coding Standard of R

Unit IV: **18 Hours**

Statistical Concept - T-Test in R , ANOVA- one way , Pearson, Spearman Correlation in R and Correlation Matrix, R Aggregate Function, R Select(), Filter(), Arrange(), Pipeline.

Unit V: **18 Hours**

Data Visualisation in R using GGPlot - Box Plot, Histograms, Scatter Plotter, Line chart, Bar Chart . Data Visualization using Plotly – 3D-view, Geo Maps, Null Handling, Merge, Grep, Scan.

Learning Resources:

Textbook

1. Roger D. Peng, "R Programming for Data Science", Leanpub, 2015
2. Dr. M. Davamani Christober,"*Concepts of Data Science using R"*, Kanthaga pookal pathipagam, 2021.

References

1. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2015.
2. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Data & Analytics Series, 2013.
3. Mark Gardener, " , "Beginning R – The Statistical Programming Language", Wiley, 2013

CO-PSO Mapping

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**
CO 1	3	2	2	3	2	1	3	2	2	1
CO 2	3	3	2	3	2	1	3	2	3	1
CO 3	3	3	3	3	2	1	3	3	3	1
CO 4	3	3	2	3	2	1	3	2	3	1
CO 5	3	3	2	3	2	1	3	2	3	1
Average	**3**	**2.66**	**2.33**	**3**	**2**	**1**	**3**	**2.33**	**2.66**	**1**

Strong -3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3604	Mobile Application Development	Core	6	6

The aim of this course is to encompass creating applications that offer seamless user experiences across various devices and platforms.

Course Outcomes

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

CO1: appreciate the importance of visualization in data analytics solutions.

CO2: apply structured thinking to solve unstructured problems.

CO3: understand a broad collection of machine learning algorithms and their applications.

CO4: learn algorithmic topics in machine learning with a mathematically rigorous approach to introduce the required theory.

CO5: develop an appreciation for the processes involved in learning from data.

Unit I : **18 Hours**

Android Fundamentals: Android overview and Versions –Features of Android – Architecture of Android - Setting up Android Environment (Eclipse/Android Studio, SDK, AVD)- Anatomy of an Android Application - Simple Android Application Development.

Unit II : **18 Hours**

Android User Interface: Layouts: Linear, Relative, Frame and Scrollview- Managing changes to Screen Orientation. Views: TextView, Button, ImageButton, EditText, CheckBox, RadioButton, RadioGroup, ProgressBar, AutoCompleteTextView, ListViews and WebView.

Unit III : **18 Hours**

Data Persistence: Saving and Loading User Preferences. File Handling: File System-Internal and External Storage-Permissions-File Manipulation-Managing Data using Sqlite: Creation of database-Insertion, Retrieval and Updation of records.

Unit IV : **18 Hours**

SMS Messaging: Sending and Receiving messages - Sending E-mail–Networking: Downloading Binary Data – Downloading Text Files.

Unit V : **18 Hours**

Location Based Services: Displaying maps- Displaying zoom control- Changing view – Adding Markers- Getting the location – Geocoding Publishing Android Applications: Preparing for publishing-Deploying APK Files.

Learning Resources:

Textbook

1. WeiMengLee, "Beginning Android Application Development", Wrox Publications, New York ,2012.

References

1. Ed Burnette, "Hello Android: Introducing Google's Mobile Development Platform", The Pragmatic Publishers, III edition, 2010.
2. Reto Meier, "Professional Android 4 Application Development", Wrox Professionals, New York,2012.

Websites

1. https://www.tutorialspoint.com/mobile_development_tutorials.htm.
2. https://www.tutorialspoint.com/android/index.htm.

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8	PSO9	PSO10
CO1	3	3	3	3	3	3	3	2	2	2
CO2	3	3	3	2	2	3	3	2	2	2
CO3	3	2	3	2	3	3	3	1	2	3
CO4	3	3	2	3	3	3	2	1	2	3
CO5	3	3	3	3	3	3	2	1	2	2
Average	**3**	**2.8**	**2.8**	**2.6**	**2.8**	**3**	**2.6**	**1.4**	**2**	**2.4**

Strong-3 **M-Medium-2** **L-Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3606	Project	Core	6	6

The aim of this course is to become proficient in the statistical analysis of data and the use of computation tools for data analysis and implement the acquired programming skills for solving real-time problems.

Course Outcomes:

At the end of the course, the student will be able to

CO1: Identify and classify the basics of a real-world problem into software solutions.

CO2: Compute and illustrate standard design and the necessary environment.

CO3: Classify and plan the relationships among project scheduling and planning process.

CO4: Evaluate and track the steps of a Data Science project, from data collection to model deployment.

CO5: Analyze the use of Data Science models and update them based on performance and feedback.

CO-PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**
Average	3	2.8	3	2.6	2.6	2.8	2	2	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3408	Marketing Analytics	DSE	5	4

The aim of this course is to understand the importance of marketing analytics for forward looking and systematic allocation of marketing resources.

Course Outcomes

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

CO1: apply key marketing theories, frameworks and tools to solve marketing problems.

CO2: identify and prioritize appropriate marketing strategies.

CO3: exercise critical judgment through engagement and reflection with existing marketing literature and new developments in the marketing environment.

CO4: critically evaluate the marketing function and the role it plays in achieving organizational success both in commercial and non-commercial settings.

CO5: evaluate and act upon the ethical and environmental concerns linked to marketing activities.

Unit I : 15 Hours

Introduction to marketing research, Research design setup, Qualitative research, Quantitative research, Concept development, scale development, Exploring Data, Descriptive Statistics. Product analytics- features, attributes, benefits, Price analytics, Promotion analytics, Channel analytics, Multiple Discriminate analysis.

Unit II : 15 Hours

Customer Analytics, Analyzing customer satisfaction, Prospecting and Targeting the Right Customers, Covariance and Correlation analysis, Developing Customers, Retaining Customers, Customer lifetime value case, Factor analysis. Market Segmentation & Cluster Analysis, Scatterplots & Correlation Analysis, Linear Regression, Model Validation & Assessment, Positioning analytics, Cross tabulation**.**

Unit III : 15 Hours

Social media landscape, Need for Social Media Analytics (SMA); SMA in Small organizations; SMA in large organizations; Application of SMA in different areas Network fundamentals and models: The social networks perspective - nodes, ties and influencers, Social network and web

data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization.

Unit IV : **15 Hours**

Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB. Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. (LinkedIn, Instagram, YouTube Twitter etc. Google analytics. Introduction. (Websites).

Unit V : **15 Hours**

Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity. Web analytics tools: Click stream analysis, A/B testing, online surveys, Web crawling and Indexing. Individual Behavior: Individual Behavior Analysis, Individual Behavior Modeling.

Textbook

1. Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World, Chuck Hemann& Ken Burbary, Pearson.

Reference Books

1.Marketing Analytics: A practical guide to real marketing science, Mike Grigsby, Kogen Page.

2.Cutting Edge Marketing Analytics: Real World Cases and Data Sets for Hands on Learning, Raj Kumar Venkatesan, Paul Farris, Ronald T. Wilcox.

Websites

1.https://www.coursera.org/learn/uva-darden-market-analytics

2.https://www.wrike.com/marketing-guide/marketing-analytics/

CO-PSO Mapping

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**
CO 1	3	2	2	3	2	1	3	2	2	1
CO 2	3	3	2	3	2	1	3	2	3	1
CO 3	3	3	3	3	2	1	3	3	3	1
CO 4	3	3	2	3	2	1	3	2	3	1
CO 5	3	3	2	3	2	1	3	2	3	1
Average	**3**	**2.66**	**2.33**	**3**	**2**	**1**	**3**	**2.33**	**2.66**	**1**

S-Strong-3 M-Medium-2 L-Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3410	Analytics for Service Industry	DSE	5	4

The aim of this course is to provide knowledge on Analytics for the Service Industry with its applications.

Course Outcomes

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

CO1: recognize challenges in dealing with data sets in service industry.

CO2: identify and apply appropriate algorithms for analyzing the healthcare, Human resource hospitality and tourism data.

CO3: make choices for a model for new machine learning tasks.

CO4: identify employees with high attrition risk.

CO5: prioritizing various talent management initiatives for your organization.

Unit I : 15 Hours

Introduction to Healthcare Data Analytics- Electronic Health Records– Components of EHR- Coding Systems- Benefits of EHR- Barriers to Adopting HER Challenges-Phenotyping Algorithms. Biomedical Image Analysis and Signal Analysis- Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models.

Unit II : 15 Hours

Applications and Practical Systems for Healthcare– Data Analytics for Pervasive Health- Fraud Detection in Healthcare- Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems- Computer- Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data.

Unit III : 15 Hours

Evolution of HR Analytics-HR information systems and data sources- HR Metric and HR Analytics-Evolution of HR Analytics- HR Metrics and HR Analytics-Intuition versus analytical thinking-HRMS/HRIS and data sources-Analytics frameworks like LAMP- HCM:21(r) Model.

Unit IV : **15 Hours**

Predicting employee performance-Training requirements-evaluating training and development-Optimizing selection and promotion decisions.

Unit V : **15 Hours**

Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing – optimized disruption management – Fraud detection in payments.

Learning Resources:

Textbook

1. Chandan K. Reddy and Charu C Aggarwal, "Healthcare data analytics", Taylor & Francis, 2015.
2. Edwards Martin R, Edwards Kirsten ,"Predictive HR Analytics: Mastering the HR Metric", Kogan Page Publishers, 2016.

References

1. Fitz-enzJac , "The new HR analytics: predicting the economic value of your company's human capital investments", AMACOM, 2010.
2. RajendraSahu, Manoj Dash and Anil Kumar. Applying Predictive Analytics Within the Service Sector Hui Yang and Eva K. Lee, "Healthcare Analytics: From Data to Knowledge to Healthcare Improvement", Wiley, 2016.
3. Fitz-enzJac, Mattox II John , "Predictive Analytics for Human Resources", Wiley, 2014.

Websites

1. https://www.ukessays.com/essays/marketing/contemporary-issues-in-marketing-marketing-essay.php.
2. https://yourbusiness.azcentral.com/examples-contemporary-issues-marketing-field-26524.html.

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8	PSO9	PSO10
CO 1	3	2	1	3	2	3	2	1	3	2
CO 2	3	3	1	3	2	3	2	1	3	2
CO 3	3	3	1	3	2	3	2	1	3	3
CO 4	3	3	1	3	2	3	2	1	3	2
CO 5	3	3	1	3	2	3	2	1	3	2
Average	**3**	**2.66**	**1**	**3**	**2**	**3**	**2**	**1**	**3**	**2.33**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3302	Shell Programming	GE	4	3

The aim of this course is to introduce students to the fundamental understanding of shell scripting and to manage files and directories through shell scripts, including creation, deletion, and manipulation.

Course Outcomes:

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

CO1:understand the basics of shell scripting and its importance in system administration and automation**.**

CO2:understand shell scripts using Unix/Linux command line utilities.

CO3:implement decision-making and looping constructs in shell scripts.

CO4:utilize shell scripts for file handling, text processing, and system management tasks.

CO5: apply best practices for shell scripting and maintainability.

Unit I : 12 Hours

Overview of Shells (Bash, Zsh, etc.) - Shell vs. other programming languages -Setting up the environment - Basic Commands and Scripting - Basic Unix/Linux commands - • Writing and executing simple scripts - File permissions and management.

Unit II: 12 Hours

Creating and using variables-Special variables and positional parameters-Command substitution - Conditional statements (if, case) -Looping constructs (for, while, until) - Combining loops and conditions.

Unit III : 12 Hours

Creating and using functions- Sourcing scripts - Automating tasks with cron jobs - Reading input from the user – Input and Output-Redirecting input and output - Working with files -reading, writing, appending).

Unit IV: 12 Hours

Creating and using arrays - Array operations and looping through arrays -Associative arrays - String manipulation and text processing - Error handling and debugging.

Unit V **12 Hours**

Basic network commands - Managing processes and jobs - Inter process Communication- Writing readable and maintainable code - Script optimization -Security considerations in shell scripting.

Learning Resources:

Textbooks

1. Arnold Robbins and Nelson H.F. Beebe, "Classic Shell Scripting: Hidden Commands that Unlock the Power of Unix", Second Edition**,** Published by O'Reilly Media,inc.

2. Stephen G.KochanJoel Grus, "Unix Shell Programming", Third Edition**,** Published by Pearson Education (US).

References

1. Robert Collins, "Shell Programming and Bash Scripting: Ultimate Beginners Guide Book" Published by Word Press, 2016.

2. Namrata Nagpal, "Unix and Shell Programming" Published by Word Press, 2009.

Websites

1. https://www.geeksforgeeks.org/introduction-linux-shell-shell-scripting/
2. https://www.tutorialspoint.com/unix/shell_scripting.htm
3. https://www.coursera.org/articles/what-is-shell-scripting

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	3	3	2	2	1
CO2	3	3	3	3	3	2	3	2	2	1
CO3	3	2	3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	3
CO5	3	3	3	3	3	2	2	2	2	3
Average	**3**	**2.6**	**3**	**3**	**3**	**2.6**	**2.4**	**2.2**	**2.2**	**2.2**

Strong -3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3304	Web Programming	GE	4	3

The aim of this course is to provide the students with foundational programming knowledge and skills for application development on the Internet.

Course Outcomes

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

CO1: explain the fundamental concepts of the internet and the principles of web design.

CO2: demonstrate knowledge of foundational web technologies such as HTML, CSS, and JavaScript.

CO3: describe the roles of front-end and back-end development in web applications.

CO4: develop basic websites using foundational web technologies.

CO5: develop web hosting services and demonstrate how to deploy web applications.

Unit I : 12 Hours

Internet- History of the internet- Internet services and accessibility – uses of the internet – protocols- web concepts – the client/server model of the web-retrieving data from the web-how web works-web browsers-searching information on the web-internet standards.

Unit II : 12 Hours

Outline of an html document-head section-prologue-link-base-meta-script-style-bodysection-headers-paragraphs-text formatting-linking-internal linking-embedding images – lists-tables-frames-other special tags and characters-html forms.

Unit III : 12 Hours

List-Types of Lists -Ordered List-Unordered List-Definition List- Adding Graphics to HTML Documents, Tables, Linking Documents, Frames.

Unit IV : 12 Hours

Introduction to JavaScript-Advantages – Writing JavaScript – Basic Programming Techniques – Type Casting, Creating Variables, Operators and Expressions, Conditional Checking, Super Controlled – Functions – User-defined Functions – Dialogue Boxes.

Unit V : **12 Hours**

Introduction-Assisted Style Sheets DOM[JSSS DOM]- Understanding Objects in HTML-Browser Objects-Object Hierarchy-Handling Events. Forms used by a Website: Form Object-Other Built-in Objects in JavaScript-User Defined Objects-Database Connection.

Learning Resources:

Textbook

1.N.P. Gopalan& J. Akilandeswari, "Web Technology", 2nd edition, PHI Learning Private Ltd 2014.

References

1." Ivan Bayross, "Web enabled commercial Application development using HTML, JAVA Script, DHTML and PHP" 4th Edition, BPB Publications.

2.Alexis Leon, Mathews Leon, "Fundamentals of Information Technology", Leon Press, 1999.

3.Lokesh Vats," Web Designing with HTML, JAVA Script, VB Script & Int-to Ecommerce Networking Internet", Cyber Tech Publication New Delhi 2003.

Websites

1. https://en.wikipedia.org/wiki/Web_development
2. https://www.geeksforgeeks.org/web-development/

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	2	1
CO2	3	3	3	3	3	2	3	2	2	1
CO3	3	2	3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	3
CO5	3	3	3	3	3	2	2	2	2	3
Average	**3**	**2.8**	**3**	**3**	**3**	**2.6**	**2.4**	**2.2**	**2.2**	**2.2**

Strong -3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC3266	Professional Competency Skill	SEC	3	2

The aim of this course is to apply theoretical and practical knowledge to design and develop a project in their chosen domain.

Course Outcomes:

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

CO1: enhance problem-solving skills through rigorous practice of quantitative, logical reasoning, and verbal ability questions.

CO2: improve time management skills to efficiently allocate time during the exam and maximize performance.

CO3: develop the ability to work collaboratively in multidisciplinary teams, integrating data science expertise with domain-specific

CO4: cultivate strong communication skills to articulate data insights and recommendations to diverse audiences, including technical and non-technical stakeholders.

CO5: engage in continuous self-assessment and feedback to identify strengths and areas for improvement, setting clear goals for success.

CO-PO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	3	3	3	2	2	2	2
CO2	3	3	3	3	3	3	2	2	1	1
CO3	3	3	3	3	3	3	2	1	1	1
CO4	3	3	3	3	3	3	2	1	1	1
CO5	3	3	3	3	2	2	2	2	1	1
Average	**3**	**3**	**3**	**3**	**2.8**	**2.8**	**2**	**1.6**	**1.2**	**1.2**

Strong -3 Medium-2 Low-1

Value Added Courses

Sem	Course Code	Course Title	Hours/Wk	Credits
II	24DSC122V	SPSS for Data Analyst	2	2
III	24 DSC221V	Business Intelligence Tool	2	2
V	24 DSC321V	Animation Techniques	2	2

Course Code	Name of the Course	Category	Hours/Wk.	Credits
DSC121V	SPSS for Data Analyst	Value Added Courses	2	2

The aim of this course is to provide fundamental knowledge about SPSS tool.

Course Outcomes

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

CO1: understand the main features of SPSS.

CO2: use the SPSS GUI effectively.

CO3: perform descriptive analysis with SPSS.

CO4: gain knowledge about common parametric and non-parametric tests.

CO5: understand the importance of Multivariate analysis.

UNIT I: 6 Hours

Introduction to SPSS - Data analysis with SPSS: general aspects, workflow, Critical issues - SPSS: general description, functions, menus, commands - SPSS file management.

UNIT II: 6 Hours

Defining variables - Manual input of data - Automated input of data and file import - Data manipulation: Data Transformation - Syntax files and scripts - Output management.

UNIT III: 6 Hours

Frequencies - Descriptive - Explore - Crosstabs – Charts.

UNIT IV: 6 Hours

Means - T-test - One-way ANOVA - Non parametric tests - Normality tests. Correlation and regression: Linear correlation and regression.

UNIT V: 6 Hours

Multivariate analysis: Factor analysis - Cluster analysis.

Learning Resources:

Textbook

1.Julie Pallant, “SPSS Survival Manual: A step by step guide to data analysis using IBM SPSS”, Routledge, 2020.

References

1.Chukwuemeka Okoro, Teach Yourself Data Analyses with SPSS: From Basic to Advance”, Independently Published,2020.

2.Field A., Discovering Statistics Using SPSS, Fourth Edition, SAGE, 2013.

Websites

1.https://www.ibm.com/docs/en/SSLVMB_28.0.0/pdf/IBM_SPSS_Statistics_Brief_Guide/.

2.https://www.spss-tutorials.com/spss-what-is-it/.

CO-PO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO 1	3	2	2	2	2	2	3	2	2	1
CO 2	3	2	3	3	1	1	3	3	2	2
CO 3	2	3	3	3	2	2	2	3	3	1
CO 4	2	3	2	2	2	1	3	2	2	2
CO 5	2	3	2	3	2	1	1	2	3	1
Average	**2.4**	**2.6**	**2.4**	**2.2**	**1.8**	**1.6**	**2.4**	**2.4**	**2.4**	**1.4**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC221V	Business Intelligence Tool	Value Added Courses	2	2

The aim of this course is to provide fundamental knowledge about creating interactive Dashboard for Data visualization using Tableau.

Course Outcomes

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

CO1: explain the basic of Tableau Desktop.

CO2 : how to Connect data with Tableau.

CO3 : understand the importance of Visualization in tableau.

CO4 : create the Functions in Tableau.

CO5 : display the various Chart types in Tableau.

Unit I: INTRODUCTION **6 Hours**

Introduction to Tableau Desktop – Tableau Products - Introducing Tableau Desktop workspace.

Unit II: CONNECTING WITH TABLEAU **6 Hours**

Connecting to Data - Data extraction - Generated Values - Different DataSource in a single worksheet- Joining Database tables with Tableau .

Unit III: VISUALIZATION IN TABLEAU **6 Hours**

Building Visualization - Chart types - Sorting Data in Tableau - Views with Filters, Sets, Groups, and Hierarchies.

Unit IV:FUNCTIONS IN TABLEAU **6 Hours**

Aggregation - Calculate values and table calculation - Use calculate dialogbox - Formulas in Table calculations - Table calculation Functions .

Unit V: APPEARANCE IN TABLEAU **6 Hours**

Forecast using Tableau - Improving Formatting in Tableau - Improving appearance to convey meaning - Appearance of Dates.

Learning Resources:

Textbook

1. Daniel G.Murray,"Tableau Your Data! Fast and Easy Visual Analysis with Tableau Software", ,2nd Edition,Wiley,2016.

References

1. Joshua N.Milligan, "Learning Tableau 2019", Packt Publishing, 2019.
2. Seema Acharya, Subhashini Chellappan, "Pro Tableau", A Press 2017.

Websites

1. https://www.tableau.com/
2. https://tabula.technology/
3. https://www.tabulae-geographicae.de/

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10
CO 1	3	2	2	2	2	1	3	2	2	1
CO 2	3	2	3	3	1	1	3	3	2	2
CO 3	2	3	3	3	2	1	2	3	3	1
CO 4	2	3	2	2	1	1	3	2	2	2
CO 5	2	3	2	3	1	1	1	2	3	1
Average	**2.4**	**2.6**	**2.4**	**2.2**	**1.4**	**1**	**2.4**	**2.4**	**2.4**	**1.4**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24DSC321V	Animation Techniques	Value Added Courses	2	2

The aim of this course is to learn the basic concept of Animation Techniques by using various tools and acquiring the knowledge in implementing 3D Animations.

Course Outcomes:

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

CO1: describe Basics of Animation, Flash environment

CO2: identify Flash tools to do simple drawing

CO3: examine the use of symbols and library in Flash environment

CO4: analyze advance animation Tools

CO5: apply animation technique to create 3D animations

Unit I: **6 Hours**

Animation: Introduction - Uses of Animation - Types of Animation-Techniques -Principles of Animation-Flash CS6- creating new document-Flash workspace-Practicing with the Flash tool.

Unit II: **6 Hours**

Getting Started with Drawing tools: Drawing in Flash-Putting all together- Using Pentool-Using combine object menu-Adding text to artwork-Working with colors-Organizing and layering Graphics-The Transform menu and Free Transform tool.

Unit III: **6 Hours**

Working with gradient-Flash CS6 tools for advanced drawing-Spraying Symbols-Masking. Introducing key frames and the Timeline-Building animation: Enter the tween- Tweening multiple objects-Incorporating color effects and scaling.

Unit IV: **6 Hours**

Introducing the Motion Editor-Controlling animation paths-Morphing graphics and colors with shape tweens-Sequencing Animation-Rendering and Animating in 3D.

Unit V: **6 Hours**

Introducing Canvas Graphical Environment-Creating animation using processing-Creating Shapes-Creating animated images-Uses of Colors-Mouse Events-Key Events-Rendering and Animating in 3D.

Text Books

1. A. Ranjan Parekh, "Principles of Multimedia" Tata McGraw Hill, New Delhi 2019.
2. Fred Gerantabee , Greg Heald, Jeremy Osborn ,"Adobe Flash Professional CS6 Digital Classroom", John Wiley & Sons, Inc.,2016.

References

1. Sandee,"Adobe Flash Professional CS6 Classroom in a Book", Adobe Creative Team, 2012.
2. Chris Grover, "Flash CS6: The Missing Manual", O'Reilly Media, Inc., 2012.

Websites

1. https://www.geeksforgeeks.org/types-of-animations-in-flash/.
2. https://processing.org/.

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10
CO 1	3	3	3	2	2	2	3	2	2	1
CO 2	3	3	3	3	2	2	3	3	2	1
CO 3	3	3	3	3	2	2	2	3	3	1
CO 4	3	3	3	2	2	2	3	2	2	1
CO 5	3	3	3	3	2	2	1	2	3	1
Average	**3**	**3**	**3**	**2.2**	**2**	**2**	**2.4**	**2.4**	**2.4**	**1**

Strong - 3 **Medium-2** **Low-1**