

## **Department of Data Science**

### **Vision**

Academic excellence setting new technological trends in the realm of Data Science

### **Mission**

As a Department, we are committed to

- Develop the skills and knowledge to analyze data in many forms and disseminate the insights.
- Enable to understand the disruption of technological change in the light of prevailing practices.
- Equip with technical skills to understand, manage and store large data sets for recent trends.
- To promote quality and professional ethics among the students.
- Equip an interdisciplinary skill set and knowing how to handle and analyze large amount of data.

**PROGRAM / COURSE FRAME FOR B.Sc Data Science**  
**CHOICE BASED CREDIT SYSTEM**  
**Batch 2020-2021 onwards**

Sem	Part	Course No.	Course Title	Hrs	Credit	Marks
1	I	TAS/FRS/ HIN XXXX	Language	3	2	30
1	II	ENS XXXX	English – I	3	2	30
1	III C	DSC 1401	Programming Paradigms	4	4	60
1	III C	DSC 1503	Relational Database Management Systems	5	5	75
1	III C	DSC 1405	RDBMS Lab	4	4	60
1	III S	DSC 1507	Digital Principles and Applications	5	4	60
1	IV E	DSC 1201	Data Science for Beginners	3	2	30
1	IV LS	DSC 1203	Data Analysis using Spread Sheet (T + L)	3 (2+1)	2	30
<b>Total</b>				<b>30</b>	<b>25</b>	<b>375</b>
2	I	TAS/FRS/H IN XXXX	Language	3	2	30
2	II	ENS XXXX	English – II	3	2	30
2	III C	DSC 1402	Principles of Data Science	4	4	60
2	III C	DSC 1504	Object Oriented Programming with Java	5	5	75
2	III C	DSC 1406	Object Oriented Programming Lab	4	4	60
2	III S	MAS XXXX	Theory of Probability	5	4	60
2	IV E	DSC 1202	Marketing Analytics	3	2	30
2	IV LS	DSC 1204	Windows and File Management (T + L)	3 (2+1)	2	30
2	V		PED/NSS/SLP		1	15
<b>Total</b>				<b>30</b>	<b>26</b>	<b>390</b>
3	I	TAS/FRS/H IN XXXX	Language	3	2	30
3	II	ENS XXXX	English – III	3	2	30
3	III C	DSC 2501	Data and Business Analytics	5	5	75
3	III C	DSC 2503	Data Structures	5	5	75
3	III C	DSC 2505	R Programming	5	5	75
3	III C	DSC 2407	R Programming Lab	4	4	60
3	III S	MAS XXXX	Statistics	5	4	60
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>

Sem	Part	Course No.	Course Title	Hrs	Credit	Marks
4	I	TAS/FRS/H IN XXXX	Language	3	2	30
4	II	ENS XXX	English – IV	3	2	30
4	III C	DSC 2502	Artificial Intelligence	5	5	75
4	III C	DSC 2504	Data Mining and Warehousing	5	5	75
4	III C	DSC 2506	Python Programming	5	5	75
4	III C	DSC 2408	Python Programming Lab	4	4	60
4	III S	MAS XXXX	Resource Management Techniques	5	4	60
4	V		PED/NSS/SLP		1	15
<b>Total</b>				<b>30</b>	<b>28</b>	<b>420</b>
5	III C	DSC 3601	Machine learning (T + L)	6 (4+2)	6	90
5	III C	DSC 3603	Software Engineering	6	6	90
5	III C	DSC 3605	Data Science Project Lab 1 (T + L)	6 (2+4)	6	90
5	III C	DSC 3507	Data Visualization	5	5	75
5	IV VE	HVS XXX	Human Values	4	2	30
5	IV LS	DSC 3201	Tableau (T + L)	3 (1+2)	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
6	III C	DSC 3602	Reinforcement Learning (T + L)	6 (4+2)	6	90
6	III C	DSC 3604	Big Data Analytics	6	6	90
6	III C	DSC 3606	Data Science Project Lab 2 (T + L)	6 (2+4)	6	90
6	III C	DSC 3508	Data Security and Compliance	5	5	75
6	IV EVS	DSC 3200	Environmental Studies	4	2	30
6	IV LS	DSC 3202	Internet of Things	3	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
<b>Grand Total (Semester I – VI)</b>				<b>180</b>	<b>160</b>	<b>2400</b>

C: MAJOR CORE

E: NONMAJOR ELECTIVE

LS: LIFESKILL

VAS – VALUE ADDED COURSES

S: MAJORSUPPORTIVE

VE: VALUE EDUCATION

EVS : ENVIRONMENTAL STUDIES

### Part III Supportive

Sem	Course No.	Course Title	Hours	Credits	Marks
1	DSC 1507	Digital Principles & Applications	5	4	60
2	MAS XXXX	Theory of Probability	5	4	60
3	MAS XXXX	Statistics	5	4	60
4	MAS XXXX	Resource Management Techniques	5	4	60
		<b>Total</b>	<b>20</b>	<b>16</b>	<b>240</b>

### Part IV Non-Major Electives

Sem	Course No.	Course Title	Hours	Credits	Marks
1	DSC 1201	Data Science for Beginners	3	2	30
2	DSC 1202	Marketing Analytics	3	2	30
		<b>Total</b>	<b>6</b>	<b>4</b>	<b>60</b>

### Part IV Life Skill Courses

Sem	Course No.	Course Title	Hours	Credits	Marks
1	DSC 1203	Data Analysis Using Spread Sheet (T + L)	3(2+1)	2	30
2	DSC 1204	Windows and File Management (T + L)	3(2+1)	2	30
5	DSC 3201	Tableau (T + L)	3(2+1)	2	30
6	DSC 3202	Internet of Things	3	2	30
		<b>Total</b>	<b>12</b>	<b>8</b>	<b>120</b>

### Value Added Courses

Sem	Course No.	Course Title	Hours	Credits
1	DSC 121V	SPSS for Data Analysts	2	2

## **Department of Data Science (UG)**

### **Program Specific Objective (PSO)**

1. Understanding the insights and working principles of Data Science.
2. Explore technical knowledge in diverse areas of Data Analytics for handling data for higher studies and a thriving career.
3. Attain the ability to adapt new technologies and upgrade their skills through their life-long learning with an attitude towards their human values and ethics.
4. Generate creativity to recognize potential risk and provide innovative solutions in various business domains.
5. Adapt and apply mathematical techniques and data analytical tools to solve complex problems in the data domain.
6. Understand the basic concepts of computing techniques and fundamentals of mathematics programming and data science domain.
7. Provide framework for Data Science users with tools that will assist them in their decision-making when faced with Information Technology ethical dilemmas.
8. Meet the programming skills and technical skills which is the requirements of the IT based industries
9. Adapting to new technologies and constantly upgrade their skills with an attitude towards independent and lifelong learning.
10. Understand the basic concepts of digital fundamentals, OOP concepts, Databases, and analytics.

## **Program Outcomes (PO's)**

**PO 1:** Abstract Thinking: Ability to understand the abstract concepts that lead to various data science theories in Mathematics, Statistics and Computer Science.

**PO 2:** Problem Analysis and Design: Ability to identify, critically analyze and design solutions to data science problems using fundamental principles of mathematics, statistics, computing sciences, and relevant domain disciplines.

**PO3:** Qualitative and Quantitative Results: Provide solutions to the complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computational science, and relevant domain disciplines.

**PO 3:** Modern Software Tool Usage: Acquire the skills in handling data analytical tools towards problem solving and solution analysis for domain specific problems.

**PO 4:** Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

**PO 5:** Innovation and Entrepreneurship: Produce innovative IT solutions and services based on global needs and trends.

**PO 6:** Societal and Environmental Concern: Utilize the data science theories for societal and environmental researches.

**PO 7:** Professional Ethics: Understand and commit to professional ethics and cyber regulations, responsibilities and norms of professional computing practices.

**PO 8:** Conduct Investigations and Complex Computing Problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

**PO 9:** Applications in Multi-disciplinary domains: Understand the role of statistical approaches and apply the same to solve the real life problems in the fields of Data Science

**PO 10:** Project Management: Apply the research based knowledge to analyze and solve advanced problems in Data Science.

### Mapping of Courses Outcomes (COs) with Programme Specific Outcomes (PSOs)

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
DSC 1401	✓	✓	✓							
DSC 1503		✓	✓	✓						
DSC 1405		✓			✓			✓		
DSC 1507		✓	✓		✓			✓		
DSC 1201	✓		✓	✓				✓		
DSC 1203		✓		✓						
DSC 1402		✓	✓	✓				✓	✓	
DSC 1504		✓	✓		✓			✓	✓	
DSC 1406		✓		✓	✓	✓		✓	✓	
DSC 1202				✓	✓	✓	✓	✓		
DSC 1204			✓	✓	✓		✓		✓	
DSC 121V		✓	✓	✓			✓		✓	

**Mapping of Programme Specific Outcomes (PSO's) with Program Outcomes (PO's)**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>PSO1</b>	✓	✓		✓	✓		✓	✓		
<b>PSO2</b>	✓	✓		✓	✓	✓	✓			
<b>PSO3</b>	✓	✓		✓	✓	✓	✓			
<b>PSO4</b>	✓	✓		✓		✓	✓		✓	
<b>PSO5</b>	✓	✓		✓	✓	✓			✓	
<b>PSO6</b>	✓	✓		✓		✓	✓	✓		
<b>PSO7</b>	✓	✓		✓	✓	✓			✓	
<b>PSO8</b>	✓	✓		✓	✓	✓			✓	
<b>PSO9</b>	✓	✓		✓	✓	✓		✓	✓	
<b>PSO10</b>	✓	✓		✓	✓	✓		✓	✓	

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**Preamble**

The aim of this course is to learn the basic concept of computer and its revolution. It gives an overview of system architecture, software, programming languages, flowcharts and pseudo code.

**Course Outcomes**

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

- i. Describe computer and its components, usage of computers in business and society, utilize internet and web resources.
- ii. Identify categories of programs, software and applications.
- iii. Understand Programming types and the basic structures of Programming.
- iv. Solve Problems using Flowcharts.
- v. Understand Pseudo code and write Pseudo code for programs.

**Unit 1 : Introduction to Computers****(10)**

Introduction to Computer Systems – Interaction with a Computer System- Input Output devices – Processing Data – Storing Data - Operating Systems – Networks – Data Communication - Connecting to the Internet – Online World .

**Unit 2 : Software****(13)**

Application software – Database management – Software Programming and Development – Protecting Privacy – Computer and Data – Programming Language Generations – First generation – second – third – fourth – fifth generations.

**Unit 3 : Programming Languages****(13)**

Procedure Oriented Programming – Object Oriented Programming – Languages –Variable – constants – reference – Data types – Control Structures – Conditional – Iteration – Nesting – Recursion – Exceptions –Data structures.

**Unit 4 : Pseudo code****(12)**

Code is all around us – Gathering program requirements – Pseudo code – program diagram – writing the first set of pseudo code – making changes and adding keywords – adding language-specific syntax – comments – final program.

**Unit 5: Introduction to Programming in C****(12)**

History of C – The C Character Set – Tokens – Identifiers – Keywords – Data Types – Constants - Variables – Operators – Structure of a C program – Formatted input/output functions – Unformatted input/output functions – Data Type Conversions – Control statements – Looping statements.

### Textbooks

1. Peter Norton, "Introduction to computers", 6<sup>th</sup> edition, Tata McGraw-Hill, 2017.
2. Anil Bikas , "The Art of Programming through Flowcharts & Algorithms", Chaudhuri – Firewall Media, 2015
3. Balagurusamy.E, " Programming in ANSI C", Eighth Edition, Tata McGraw Hill-2019.

### References

1. Yashwvant Kanetkar, "Let us C:, BPB Publications", 13th Edition, 2014
2. Martin J. Gentile, " An Easy Guide to Programming in C Create Space Independent Publishing Platform" , 2nd Edition , 2015.
3. Jonathan Bard," Using Pseudocode: Instructions in Plain English ", PowerKids Press, 2018.

### Mapping of Course Outcomes with Bloom's Taxonomy

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1		2				
CO2			3			
CO3		2				
CO4			3			
CO5			3			

Mean : 2.6

**Preamble**

The aims 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. It covers practical concepts of SQL and PL/SQL.

**Course Outcomes**

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

- i. Learn the fundamentals of Data Models and to represent a Database system.
- ii. Express the basic concepts of SQL and PL/SQL.
- iii. Gain knowledge about Entity Relationship Model.
- iv. Gain an introductory knowledge about Relational Database Design.
- v. Understand the fundamental concepts of Transaction Processing and Concurrency Control Techniques.

**Unit 1 – INTRODUCTION TO DBMS (12)**

What is Data – Types of Data – What is Database – What is DBMS – Advantages of DBMS – Disadvantages of DBMS – Database Architecture – Two Tier Architecture – Three Tier Architecture - Data Flow from external to internal world – Database Models – Overall system structure - Database administrator and Database users.

**Unit 2 – INTRODUCTION TO SQL (17)**

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

**Unit 3 - ENTITY RELATIONSHIP MODEL (16)**

E-R model: E-R diagram – Entity Set – Relationship – Degree - Weak Entity Set - Relational algebra – Keys – Need of Keys – Super Key, Candidate Key, Composite Key, Primary Key, Foreign Key – Constrains – Unique, Not null, Default, Check.

**Unit 4 – RELATIONAL DATABASE DESIGN (15)**

Relational database design – Schema – Goals of Normalization - First normal form - Pitfalls in relational database design - Functional Dependencies – Uses of Functional Dependencies - Decomposition - Boyce–codd normal form - Third normal form – Multivalued Dependencies - Fourth normal form – Denormalization

**Unit 5- TRANSACTIONS (15)**

Transaction Concepts – ACID Properties – Transaction States – Schedules – Serializability – Concurrency Control – Lock Based Protocol – Two-Phase Locking Protocol

**Textbooks**

1. MukeshNegi, “Fundamental of Database Management System: Learn Essential Concepts of Database Systems”, BPB Publications, 2019.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, McGraw-Hill Education, 7<sup>th</sup> Edition, 2019.

## References

1. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill College Publications, 2015.
2. Walter Shields, "SQL QuickStart Guide: The Simplified Beginner's Guide to Managing, Analysing, and Manipulating Data With SQL", 2019
3. Bella Cunningham, "Database Systems: Design, Implementation and Management", 2019.

## Mapping of Course Outcomes with Bloom's Taxonomy

<b>Bloom's Taxonomy</b>	<b>K1: Remembering</b>	<b>K2: Understanding</b>	<b>K3: Applying</b>	<b>K4: Analyzing</b>	<b>K5: Evaluating</b>	<b>K6: Creating</b>
<b>CO1</b>			<b>3</b>			
<b>CO2</b>			<b>3</b>			
<b>CO3</b>		<b>2</b>				
<b>CO4</b>			<b>3</b>			
<b>CO5</b>				<b>4</b>		

**Mean : 3.0**

**Preamble**

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

- i. Develop database using SQL.
- ii. Examine queries in SQL to retrieve any type of information from a data base.
- iii. Classify various functions available in DML commands
- iv. Construct queries using DCL commands.
- v. Build procedure using join operations.

**Lab Components**

1. Creating database tables and using Data Types.  
Create Table, Modify Table, Drop Table.
2. Practical Based on Data Manipulation.  
Adding data with Insert, Modify data with Update, Deleting records with Delete.
3. Practical Based on Implementing the Constraints.  
NULL and NOT NULL, Primary Key and Foreign Key Constraint, Unique, Check and Default Constraint.
4. Practical for Retrieving Data Using following clauses.  
Simple select clause, Accessing specific data with Where, Ordered By, Distinct and Group By.
5. Practical Based on Aggregate Functions.  
AVG, COUNT, MAX, MIN, SUM.
6. Practical Based on implementing all String functions.
7. Practical Based on implementing Date and Time Functions.
8. Practical Based on implementing use of union, intersection, set difference.
9. Implement Nested Queries.
10. Implement JOIN operation.

**Preamble**

The aim of this course is to understand the basic concepts of digital logic and the design of basic logic circuits. It also helps the student to learn combinational and sequential circuits.

**Course Outcomes**

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

- i. Perform conversion and arithmetic calculations in binary, decimal and hexadecimal number system.
- ii. Gain knowledge on the application of digital principles using Gates, solve Boolean Algebra and simplify using K-map
- iii. Analyze and synthesize combinational Logic Circuits.
- iv. Compare various types of Flip flops and counters for data storage.
- v. Acquire knowledge on shift Registers, Ring and Johnson's counters.

**Unit 1: Number System****(14)**

Digital Concepts: Introduction, Decimal numbers, Binary numbers, Decimal to binary conversions, Binary arithmetic, 1's and 2's complements of Binary numbers, Signed numbers, Arithmetic operations. Hexadecimal numbers, Octal numbers, Digital codes, Binary coded decimal (BCD).

**Unit 2: Building Blocks****(16)**

Logic Gates: Positive and negative logic, NOT gate, AND gate, OR gate, NAND gate, NOR gate, EX-OR and EX-NOR gates. Boolean Algebra: Boolean operations, logic expressions, rules and laws of Boolean algebra, De Morgan's theorems, Boolean analysis of logic circuits, Simplification using Boolean algebra, Standard forms, SOP and POS Expressions, Karnaugh map techniques SOP & POS (up to 4 variables).

**Unit 3: Combinational Logic Circuits:****(17)**

Combinational Logic Circuits: Implementation, Universal property of NAND and NOR gates, Half adder, Full adder, Parallel binary adder, Comparators, Decoders, BCD to 7-segment decoder, Encoders, Code converters, Multiplexers and Demultiplexers, Parity generators and Checkers .

**Unit 4: Sequential Logic Circuits****(13)**

Sequential Logic Circuits: SR Latches, Gated S-R latch, gated D latch, Flip - Flops: Edge triggered flip flops, Master Slave flip flops, Applications Counters: Asynchronous counters, Decade Asynchronous counters, Synchronous counters, synchronous Decade counters, up/down synchronous counter, Applications.

**Unit 5: Shift Register and Counters:****(15)**

Shift Register: serial in - serial out, serial in - parallel out, parallel in - serial out, parallel in parallel out configurations. Ring counter, Johnson's counter

**Textbook:**

1. Thomas L. Floyd & RP Jain , “Digital Fundamentals”, 10th Edition, Pearson Edition, 2018.

Unit 1: Digital Fundamentals	Pg No: (28 - 70)
Unit 2: Digital Fundamentals	Pg No: (86 - 160)
Unit 3: Digital Fundamentals	Pg No: (186 - 198) (222 - 228) & (235 -268)
Unit 4: Digital Fundamentals	Pg No: (291 - 310) & ( 327 - 357)
Unit 5: Digital Fundamentals	Pg No: (382 – 395) & (399 – 402)

**References :**

1. P. Malvino, “Digital Principles and Applications”, McGraw Hill Int., Fourth Edition, 2017
2. R. P. Jain,” Modern Digital Electronics”, Tata McGraw Hill Pub. Company, Third Edition, 2018.

**Mapping of Course Outcomes with Bloom’s Taxonomy**

Bloom’s Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1		2				
CO2			3			
CO3				4		
CO4			3			
CO5		2		4		

**Mean : 3.0**

**Preamble**

The aim of this course provides an outline of data science. It give the overview of computer data, structure, introduction about data science and 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

- i. Understand the fundamental concepts of computer data and its types.
- ii. Identify the process of data science.
- iii. Determine the goal of data process.
- iv. Analyse various data cleaning methods to clean collected data.
- v. Summarize data models to suitable problem and findings.

**Unit 1: Types of Data****(7)**

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 2: Data Science process****(9)**

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

**Unit 3: Process goal****(10)**

Defining research goals and creating a project charter- Spend time understanding the goals and context of your research - Create a project charter - Retrieving data - Retrieving data - Don't be afraid to shop around - Do data quality checks now to prevent problems later

**Unit 4: Cleaning data****(10)**

Cleansing, Integrating, and Transforming data - Cleansing data - Correct errors as early as possible - Combining data from different data sources - Transforming data

**Unit 5: Building model****(9)**

Exploratory data analysis - Build the models- Model and variable selection - Model execution - Model diagnostics and model comparison -Presenting findings and building applications on top of them

**Textbook:**

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

**Chapters:**

Unit I: Chapter 1.2, 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.2.5, 1.2.6, 1.2.7.

Unit II: Chapter 1.3, 1.3.1, 1.3.2,1.3.3,1.3.4,1.3.5,1.3.6.

Unit III: Chapter 2.2, 2.3.

Unit IV: Chapter 2.4, 2.4.1, 2.4.2,2.4.3,2.4.4.

Unit V: Chapter 2.6.1, 2.6.2, 2.6.3.

## References

1. Annalyn Ng, "Data Science for the Layman", Shroff Publishers; First edition, 2018.
2. Dinesh Kumar. U, "Business Analytics: The Science of Data-Drive Decision Making", Wiley, 2017.

## Mapping of Course Outcomes with Bloom's Taxonomy

<b>Bloom's Taxonomy</b>	<b>K1: Remembering</b>	<b>K2: Understanding</b>	<b>K3: Applying</b>	<b>K4: Analyzing</b>	<b>K5: Evaluating</b>	<b>K6: Creating</b>
<b>CO1</b>		<b>2</b>				
<b>CO2</b>		<b>2</b>				
<b>CO3</b>			<b>3</b>			
<b>CO4</b>				<b>4</b>		
<b>CO5</b>			<b>3</b>			

**Mean : 2.8**

**Preamble**

The aim of this course is to understand the basic of Spread Sheet, Formulas, Functions, Charts and presentation techniques to maximize impact. It enables macros to increase interactivity, Using PivotTables and Power Pivots to turn raw data into clear information that supports key decisions.

**Course Outcomes**

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

- i. Describes the basics of the spread sheet and Tables
- ii. Understand the basic Formulas and Functions in Excel
- iii. Gain knowledge about Pivot table and to consolidate data
- iv. Develop macros and understand importance of Data Validation
- v. Express the different types of Charts in Excel

**Unit 1: INTRODUCTION TO EXCEL (8)**

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 – Adding comments to cells – Working to Tables

**Unit 2: FORMULAS AND FUNCTIONS (9)**

Formulas Basics – Entering formula in Worksheet – Editing Formulas – Using Cell Reference in Formulas – Formulas in Tables – Calculating Percentage – Rounding Numbers – Counting values in a Range – Working with Text – Using Text Functions – Excels Date and Time Functions

**UNIT III: PIVOT TABLE, CONSOLIDATE DATA (10)**

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 PivotChart - Prompting for User Input - Using the If...Then...Else Statement - Using Goal Seek – Consolidating Data

**Unit 4: MANAGING AND ANALYZING DATA, MACRO (9)**

Importing Data – Cleaning up Data – Exporting Data – Data Validation – Validation Criteria – Creating Drop Down List – Formulas for Data Validation Rules – Data Validation Formula – Loading Data from other Data Sources - Working with Macros - Recording a Macro - Playing and Deleting a Macro - Adding a Macro to the Quick Access Toolbar – Scenario Manager

**Unit 5 : CHARTS AND VISUALIZATION (9)**

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

**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.
3. LokeshLalwani, “Excel 2019 All-In-One”, BPB Publications, 2019.

**Mapping of Course Outcomes with Bloom’s Taxonomy**

<b>Bloom’s Taxonomy</b>	<b>K1: Remembering</b>	<b>K2: Understanding</b>	<b>K3: Applying</b>	<b>K4: Analyzing</b>	<b>K5: Evaluating</b>	<b>K6: Creating</b>
<b>CO1</b>			<b>3</b>			
<b>CO2</b>			<b>3</b>			
<b>CO3</b>				<b>4</b>		
<b>CO4</b>			<b>3</b>			
<b>CO5</b>		<b>2</b>				

**Mean : 3.0**

**Preamble**

The aim of this course is to understand the fundamental concepts of Data Science and acquire the overview of data engineering and business intelligence. It inculcates the importance of data visualization techniques, machine learning and statistical modeling which are used in data science domain

**Course Outcomes**

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

- i. Explore the fundamental concepts of data science.
- ii. Apply data analysis techniques used for business applications.
- iii. Select and implement machine learning techniques to data science applications.
- iv. Utilize data visualization tools to Data Science applications.
- v. Identify the computing environments that are suitable for the Data Science applications.

**Unit 1 – Fundamentals (12)**

Introduction: Data Science- A Brief History of Data Science - A History of Data Analysis - The Emergence and Evolution of Data Science. Where Is Data Science Used?:What Are Data, and What Is a Data Set?: Perspectives on Data. A Data Science Ecosystem: Moving the Algorithms to the Data - The Traditional Database or the Modern Traditional Database.

**Unit 2 – Data Engineering and Business Intelligence (16)**

Exploring Data Engineering Pipelines and Infrastructure: Defining Big Data by the Three Vs - Identifying Big Data Sources - Difference between Data Science and Data Engineering - Making Sense of Data in Hadoop. Applying Data-Driven Insights to Business and Industry. Benefiting from Business-Centric Data Science

**Unit 3 - Machine Learning and Statistical Modeling (17)**

Learning from Data with Your Machine: Defining Machine Learning and Its Processes - Learning Styles - Selecting algorithms based on function. Math, Probability, and Statistical Modeling: Exploring Probability and Inferential Statistics - Quantifying Correlation - Reducing Data Dimensionality with Linear Algebra - Introducing Time Series Analysis.

**Unit 4 – Data Visualization (14)**

Data Visualizations: The Big Three - Picking the Most Appropriate Design Style - Selecting the Appropriate Data Graphic Type - Web-Based Applications for Visualization Design: Designing Data Visualizations for Collaboration - Visualizing Spatial Data with Online Geographic Tools.

**Unit 5 - Computing for Data Science (16)**

Using Python for Data Science: Sorting Out the Python Data Types - Putting Loops to Good use in Python - Using Open Source R for Data Science - R's Basic Vocabulary - Delving into Functions and Operators - Doing Data Science with Excel: Making Life Easier with Excel.

### Textbooks

1. John D. Kelleher and Brendan Tierney, “Data Science”, First Edition, The MIT Press, London, 2018.  
Unit I (Text Book 1): Chapter 1.1, 1.2, 1.3, 2.1, 3.1, 3.2.
2. Lillian Pierson, “Data Science for Dummies”, 2<sup>nd</sup> Edition, John Wiley & Sons publications, 2017.  
Unit II (Text Book 2): Chapter 2.1, 2.2, 2.3, 2.4.  
Unit III (Text Book 2): Chapter 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7.  
Unit IV (Text Book 2): Chapter 9.1, 9.3, 9.5, 11.1, 11.2.  
Unit V (Text Book 2): Chapter 14.1, 14.2, 15.1, 15.2, 17.1.

### References

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “Introducing Data Science”, Manning Publications Co, 2016.
2. Ramesh Sharda, DursunDelen, Efraim Turban, “Business Intelligence, Analytics, and Data Science: A Managerial Perspective”, Pearson Education, Fourth edition, 2019.

### Mapping of Course Outcomes with Bloom’s Taxonomy :

Bloom’s Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1			3			
CO2		2				
CO3			3			
CO4				4		
CO5			3			

Mean : 3.0

**Preamble**

The objective 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

- i. Describe the fundamentals of the Object-Oriented Programming including defining Classes and Objects.
- ii. Define Java structural design write, Compile and Execute programs
- iii. Apply the principles of inheritance and polymorphism and implement in Java
- iv. Write programs using the interface, packages and exceptions.
- v. Understand I/O streams and use applets for real world problems.

**Unit 1: Introduction to OOP and Java basics (10)**

Principles of Object Oriented Programming (OOP)- Software Evaluation- OOP Paradigm- Benefits of OPP- Application of OOP – Abstraction – objects and classes – Encapsulation- Inheritance – Polymorphism- OOPs in Java – Characteristics of Java–Java Environment – Java Source File Structure – Compilation.

**Unit 2: Java fundamentals (13)**

Fundamental Programming Structures in Java –Data Types- Variables- Operators- Control Flow- Arrays – Packages -Concept & Syntax Of Class - Concept & Syntax Of Methods - Fields and Methods -Constructors & Destructors –Encapsulation - Access Specifiers -Access Control - Defining a Class- Creating an Object- Accessing Class Members- Instance Data and Class Data -Defining Methods –Constructors - Access Modifiers

**Unit 3: Inheritance (13)**

String Builder and String Buffer - Methods and Messages - Parameter Passing -Comparing and Identifying Objects - Inheritance in Java - use of Inheritance - Types Of Inheritance – Single - Multi-level - Hierarchical - Hybrid - Method Overloading - Method Overriding Polymorphism in Java - Types Of Polymorphism - Super keyword -Super classes- sub classes.

**Unit 4: Interfaces, Packages and Exceptions (12)**

Interfaces – defining an interface- implementing interface- differences between classes and interfaces and extending interfaces- Implementing and Extending Interfaces - Abstract Classes - Define Package - Types Of Packages - Naming Convention - Steps For Creating Packages -The import Statement -Static Imports - CLASSPATH and Import - Exceptions – exception hierarchy – throwing and catching exceptions – built-in exceptions

**Unit 5: I/O Streams and Applet Programming (12)**

Files: Introduction – concept of streams – Stream classes – Using stream – I/O classes – File class – I/O Exceptions – creation of files – Reading / Writing characters/ Bytes – Handling primitive data types – Random Access Files. Applet Programming – Graphics programming: The Graphics class-Lines and rectangles-Circles and ellipses-Drawing arcs-Drawing polygons-Line graphs-Using Control loops in applets-Drawing Bar charts.

**Textbooks**

1. M.T.Somashekaa, D.S.Guru, K.S.Manjunatha, “Object Oriented Programming with JAVA “,PHI Learning Private Limited, 2017
2. E.Balagurusamy , “Programming with JAVA” McGraw Hill Education Private Limited, 2019

**References**

1. Danny Poo, Derek Kiong, Swarnalatha Ashok, “Object – Oriented Programming and Java”, 2nd edition, Springer, 2015
2. Stuart Reges, Martin Stepp , “Building Java Programs: A Back to Basics Approach”, 4th edition, Pearson 2017.

**Mapping of Course Outcomes with Bloom’s Taxonomy**

<b>Bloom’s Taxonomy</b>	<b>K1: Remembering</b>	<b>K2: Understanding</b>	<b>K3: Applying</b>	<b>K4: Analyzing</b>	<b>K5: Evaluating</b>	<b>K6: Creating</b>
<b>CO1</b>			<b>3</b>			
<b>CO2</b>			<b>3</b>			
<b>CO3</b>		<b>2</b>				
<b>CO4</b>				<b>4</b>		
<b>CO5</b>			<b>3</b>			

**Mean : 3.0**

**Preamble:**

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, the student will be able to:

- i. Classify a simple application using Java programming.
- ii. Develop robust program using Exception Handling.
- iii. Implement application software and enhance problem solving ability.
- iv. Create Client Server application using JDBC.
- v. Design a application using Applet.

**Lab Components**

1. Working with Array and flow control statement.
2. Demonstrate the concept of command line arguments.
3. Implementation of Inheritance.
4. String Manipulation using Char Array.
5. Creating program using Interface.
6. Implementing Thread based applications & Exception Handling.
7. Implementing File concept.
8. Creating application using User-defined exception.
9. Creation of applet and passing parameter to Applet.
10. Design simple calculator using applet

**Preamble**

This objective of this course will enable the student to gain knowledge about the marketing strategy, survival analysis, Panel regression: how to use a cross-sectional time series, Strategic uses of segmentation, Implementing Big Data and Big Data analytics. It will also help the student to identify various types of marketing analytics.

**Course Outcomes**

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

- i. Identify the main components of marketing strategy and consumer behavior.
- ii. Explain the function of survival analysis, predictive analysis and superior to descriptive analysis.
- iii. Illustrate the Panel regression, data structure, fixed effects model and random effects model and testing.
- iv. Categorize various segmentation and conceptual working process.
- v. Extend the learning of Big Data , Big Data analytics and Exotic Algorithms.

**Unit 1: INTRODUCTION****(8)**

Brief principles of consumer behaviour and marketing strategy - Introduction - Consumer behaviour as the basis for marketing strategy - Overview of consumer behaviour - Overview of marketing strategy - An Insight

**Unit 2: SURVIVAL ANALYSIS :****(10)**

When are my customers most likely to buy? - Introduction -Conceptual overview of survival analysis - Business case - More about survival analysis - Model output and interpretation - Lifetime value: how predictive analysis is superior to descriptive analysis

**Unit 3: PANEL REGRESSION****(9)**

– how to use a cross-sectional time series : - Introduction - What is panel regression- Panel regression: details - The data structure - The fixed effects model - The random effects model - Testing which effects to model -Business case

**Unit 4: SEGMENTATION****(8)**

Introduction - Strategic uses of segmentation - part of a strategic marketing -Criteria for actionable segmentation - Conceptual process: Settle on a (marketing/customer) strategy - Collect appropriate (behavioural) data - Create/use additional data - Run the algorithm - Profile the output - Model to score database - Test and Learn

**Unit 5: BIG DATA****(10)**

Implementing Big Data and Big Data Analytics: – Introduction - Is Big Data important - Surviving the Big Data panic - Big Data analytics - Big Data – Exotic algorithms

**Textbook**

1. Mike Grigsby, “Marketing Analytics: A practical guide to improving consumer insights using data techniques” Second Edition, 2018.

Unit I: Marketing Analytics , (Chapter 1, 2), (20 – 33)

Unit II: Marketing Analytics, (Chapter 6), (84 -95)

Unit III: Marketing Analytics, (Chapter 7), (100 – 107)

Unit IV: Marketing Analytics, (Chapter 9), (121 – 133)

Unit V: Marketing Analytics, (Chapter 12), (185 -194)

**References:**

1. Wayne L. Winston, “Marketing Analytics: Data–Driven Techniques with Microsoft Excel”, Wiley; First edition, 2014.
2. Dinesh Kumar. U,” Business Analytics: The Science of Data-DriveDecision Making”, Wiley, 2017.

**Mapping of Course Outcomes with Bloom’s Taxonomy**

<b>Bloom’s Taxonomy</b>	<b>K1: Remembering</b>	<b>K2: Understanding</b>	<b>K3: Applying</b>	<b>K4: Analyzing</b>	<b>K5: Evaluating</b>	<b>K6: Creating</b>
<b>CO1</b>		<b>2</b>				
<b>CO2</b>			<b>3</b>			
<b>CO3</b>		<b>2</b>				
<b>CO4</b>				<b>4</b>		
<b>CO5</b>		<b>2</b>				

**Mean : 2.6**

**Preamble :**

The aim of this course provides knowledge of Windows Operating System and Files. It gives the overview of Computer Operating System, windows history, control panel, computer management, files and folders and windows accessories.

**Course Outcomes**

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

- i. Understand the history of windows operating system.
- ii. Identify the settings of control panel.
- iii. Understand the computer management tools.
- iv. Utilize file settings and operations.
- v. Apply accessories to user operations.

**Unit 1: Introduction to Windows Operating System (9)**

Windows History –use a Start menu and Apps – personalize your desktop – creating and editing text files – Windows explorer and options – Windows shortcut keys

**Unit 2: Control Panel (10)**

Control panel – User management – Program installation and Uninstallation – Sound – Display – Taskbar – Internet options – Recycle bin

**Unit 3: Computer management (8)**

Computer management – device manager – msconfig – Windows startup – Windows task manager.

**Unit 4: Files and folders (9)**

Creating files –file operations - dialog boxes – creating folder – remove folder – hidden folders and hidden files – read only and archive files – compressed files – files and folder security.

**Unit 5: Accessories (9)**

Command Prompt - Paint – Sound recording – Snipping tool – Run command

**Textbooks**

1. Paul McFedries, “Teach Yourself VISUALLY Windows 10”, Visual Publishers; First edition, 2020.
2. Rick Rouse, “Master Guide To Protecting Your Privacy And Security With Windows 10” , Wiley, 2017.

**References**

1. Michael Miller, “My Windows 10 Computer for Seniors”, QUE, 2020.
2. Alan Emsbury, “Windows 10: 2020 Beginners Guide to Unlock the True Potential of your Operating System”, Independently Published, 2020.

### Mapping of Course Outcomes with Bloom's Taxonomy

<b>Bloom's Taxonomy</b>	<b>K1: Remembering</b>	<b>K2: Understanding</b>	<b>K3: Applying</b>	<b>K4: Analyzing</b>	<b>K5: Evaluating</b>	<b>K6: Creating</b>
<b>CO1</b>			<b>3</b>			
<b>CO2</b>		<b>2</b>				
<b>CO3</b>		<b>2</b>				
<b>CO4</b>			<b>3</b>			
<b>CO5</b>		<b>2</b>				

**Mean : 2.4**

## VALUE ADD-ON COURSES

DSC 121V

SPSS for Data Analysts

2 Hrs/ 2Cr.

### Preamble

The aim of the course is to provides the basic knowledge of the program in order to be able to use it in a socio-economic context and in the exploration of corporate data.

### Course Outcomes:

At the end of this course, the student should be able to:

- i. Understand the main features of SPSS.
- ii. Use the SPSS GUI effectively.
- iii. Perform descriptive analysis with SPSS.
- iv. Perform common parametric and non-parametric tests.
- v. Perform simple regressions and multivariate analyses (factor and cluster).

### Unit 1: INTRODUCTION

(6)

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

### Unit 2: INPUT AND DATA CLEANING

(6)

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

### Unit 3: DESCRIPTIVE ANALYSIS OF DATA

(6)

Frequencies - Descriptive - Explore - Crosstabs – Charts

### Unit 4: STATISTICAL TESTS

(6)

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

### Unit 5: ANALYSIS

(6)

Multivariate analysis: Factor analysis - Cluster analysis

### Methodology of Teaching – Learning

One hour for teaching a concept and one hour for Hands on Training.

### References:

1. Julie Pallant, SPSS Survival Manual: A step by step guide to data analysis using IBM SPSS, Routledge, July 2020.
2. Chukwuemeka Okoro, Teach Yourself Data Analyses with SPSS: From Basic to Advance, Independently Published, May 2020.
3. Field A., Discovering Statistics Using SPSS, Fourth Edition, SAGE, 2013

### Mapping of Course Outcomes with Bloom's Taxonomy

<b>Bloom's Taxonomy</b>	<b>K1: Remembering</b>	<b>K2: Understanding</b>	<b>K3: Applying</b>	<b>K4: Analyzing</b>	<b>K5: Evaluating</b>	<b>K6: Creating</b>
<b>CO1</b>		<b>2</b>				
<b>CO2</b>			<b>3</b>			
<b>CO3</b>			<b>3</b>			
<b>CO4</b>				<b>4</b>		
<b>CO5</b>			<b>3</b>			

**Mean : 3**