Mahatma Education Society's

Pillai HOC College of Arts, Science & Commerce (Autonomous)

Rasayani

Affiliated to University of Mumbai
NAAC Accredited with "A+" Grade in cycle II
ISO 9001:2015 Certified

SYLLABUS

Bachelors of Science (B. Sc.) in Data Science

F. Y. B. Sc. Data Science

As per National Education Policy 2020

Academic Year 2026-27

Mahatma Education Society's
College Code: 870
PILLAI HOC COLLEGE OF ARTS, SCIENCE & COMMERCE
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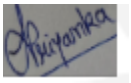
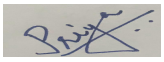
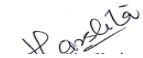
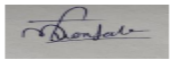
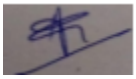
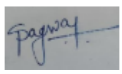
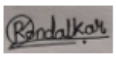
(NAAC Accredited 'A+' Grade , CGPA – 3.26 in Cycle 2 & ISO 9001:2015 Certified)
Affiliated to the University of Mumbai, Approved by Government of Maharashtra
(AUTONOMOUS COLLEGE)

Sr. No	Name	Designation	Signature
1	Dr. Swapna Kadam	Vice Chancellor Nominee	
2	Dr. Annie Rajan,	Subject Expert	
3	Dr. Homraj Patelpaik	Subject Expert	
4	Mr. Swapnil H. Patil	Industry Representative	
5	Mr. Akash Ghadge	Alumni Representative	
6	Dr. Rinkoo Shantnu	Principal	
7	Ms. Priyanka Sorte	Member	
8	Ms. Priya Prakash	Member	
9	Ms. Harshita Singh	Member	
10	Ms. Mrunal Wanjale	Member	
11	Ms. Arpita Kante	Member	
12	Ms. Anita Mhatre	Member	
13	Ms. Sangeeta Menon	Member	
14	Ms. Aarti Wani	Member	
15	Ms. Rutuja Madane	Member	
18	Ms. Sonali Dagwar	Member	
19	Ms. Rutuja Kondalkar	Member	

INTRODUCTION

A **Data Science** degree program is a dynamic educational pathway that equips students with a multidisciplinary skill set essential for navigating the intricacies of the data-driven world. Foundational courses in mathematics and statistics lay the groundwork, while programming skills in languages like Python and Rare are honed for data manipulation and analysis. The curriculum delves into machine learning techniques, covering both supervised and unsupervised learning, and explores big data technologies such as Hadoop and Spark. Students gain practical experience in applying these skills to real-world problems through capstone projects, ensuring they are well-prepared to address the challenges of data science in diverse industries. Furthermore, Data Science degree programs emphasize the ethical considerations surrounding data use and privacy. Students engage in discussions about responsible conduct in data science, addressing the societal implications of their work. The program typically culminates in the development of strong communication skills, with a focus on data visualization and effective presentation of findings to non-technical stakeholders. Through a combination of theoretical knowledge, practical experience, and ethical considerations, graduates of Data Science degree programs are well- positioned to make meaningful contributions in a data-driven world.

Programme Outcomes (POs)

PO. No.	PO Title	POs in brief
PO1	Fundamental Knowledge Acquisition	Graduates will demonstrate a comprehensive and foundational knowledge of their chosen discipline along with an awareness of interdisciplinary connections.
PO2	Critical Thinking and Analytical Reasoning	Graduates will be able to analyze complex problems, synthesize data from multiple sources (qualitative and quantitative), and employ logical reasoning to formulate well-supported conclusions and arguments.
PO3	Effective Communication	Graduates will exhibit proficiency in both written and oral communication, articulating ideas clearly, persuasively, and ethically to diverse audiences
PO4	Problem Solving	Graduates will possess the ability to identify, formulate, and design solutions for real-world problems in their professional or social contexts, applying relevant theoretical knowledge and practical skills.
PO5	Information and Digital Literacy	Graduates will demonstrate the capability to locate, evaluate, and effectively use information from various sources, and utilize modern tools and Information and Communication Technology (ICT) for professional and academic tasks.
PO6	Research Skills and Scientific Temperament	Graduates will develop a sense of inquiry and research methodology, including the ability to design experiments (where applicable), collect and analyses data, and interpret results while maintaining scientific rigor and intellectual honesty.
PO7	Ethical Reasoning and Professional Integrity	Graduates will recognize ethical dilemmas, commit to professional and academic ethics, and demonstrate an understanding of moral and social responsibilities in their personal and professional conduct.
PO8	Employability and Professional Skills	Graduates will acquire the necessary job-ready skills, managerial competencies, and professional values to secure gainful employment or pursue advanced education in their respective fields.
PO9	Environmental and Sustainability Consciousness	Graduates will understand the importance of environmental conservation and sustainable development, displaying responsibility toward ecological challenges and advocating for healthy environmental practices.
PO10	Life-Long Learning	Graduates will develop the capacity for independent and self-directed learning to continuously upgrade their knowledge and skills, enabling them to adapt to rapid technological and societal changes.
PO11	Civic and Social Responsibility	Graduates will act as responsible citizens with an informed awareness of constitutional values, engaging proactively in community development and addressing social needs.
PO12	Empathy and Social Intelligence	Graduates will be able to cultivate and demonstrate affective, interpersonal, social and emotional intelligence.

Programme Specific Outcomes (PSOs)

PSO. No.	PSO Title	PSOs in brief
PSO1	Analytical Modeling and Solution Design	Students can formulate and implement robust predictive models and analytical solutions to address complex domain-specific problems by selecting and optimizing appropriate statistical and machine learning algorithms
PSO2	Scalable Data System Competency	Students can architect and deploy scalable data pipelines and storage mechanisms capable of ingesting, cleaning, and processing massive, unstructured datasets efficiently using distributed computing frameworks and cloud technologies.
PSO3	Responsible Practice and Research	Students can critically evaluate the ethical implications of data science interventions—including algorithmic bias, data privacy, and societal impact—while demonstrating the ability to independently research and integrate emerging methodologies.
PSO4	Professional Communication and Adaptability	Students can translate complex technical findings into actionable business insights for non-technical stakeholders through effective data storytelling and visualization, while demonstrating adaptability and leadership within cross-functional teams.

Evaluation Pattern

Marking Code	Marking Scheme
A	50 Marks Semester End Exam, 50 Marks Continuous Assessment (distributed within 15 Marks Class Test, 15 Marks Presentation & Assignment, 10 Marks Online Quiz, 10 Marks Attendance & Class Participation)
B	50 Marks Semester End Exam
C	100 marks Continuous Assessment (distributed within 30 Marks Class Test, 30 Marks Presentation & Assignment, 30 Marks Online Quiz, 10 Attendance & Class Participation)
D	50 Marks of Continuous Assessment (distributed within 15 Marks Class Test, 15 Marks Presentation & Assignment, 10 Marks Online Quiz, 10 Marks Attendance & Class Participation)
E	50 Marks Practical Examination (distributed within 30 Marks Practical Module 1 & 2, *10* Marks Journal, 10 Marks Viva)

Course Structure

Semester - I							
Course Code	**Course Type**	**Course Title**	**Theor/ Practical**	**Marks**	**Credits**	**Lectures / Week**	**Evaluation Pattern**
HUSDS101	Major	Introduction To Python Programming	Theory	100	2	2	A
HUSDS101P	Major-Practical	Practical (HUSDS101)	Practical	50	1	2	E
HUSDS102	Major	R Programming	Theory	100	2	2	A
HUSDS102P	Major-Practical	Practical (HUSDS102)	Practical	50	1	2	E
HUSDS103	Minor	Descriptive Statistics	Theory	100	2	2	A
HUSDS103P	Minor-Practical	Practical (HUSDS103)	Practical	50	1	2	E
HUSDS104	SEC	Excel For Business	Theory	100	2	2	A
HUSDS104P	SEC-Practical	Practical (HUSDS104)	Practical	50	1	2	E
HUSDS105	Major	Indian Roots of Information System	Theory	50	2	2	C
HUAEC101	AEC	Communication Skills in English	Theory	100	2	2	D
HUVEC101	VEC	Fundamentals of Social and Emotional Skills	Theory	100	3	3	D
HUOE104	OE	Basics OF Marketing Mix	Theory	100	3	3	D
		Total Credits		**850**	**22**		**

Abbreviations:

SEC: Skill Enhancement Course
AEC: Ability Enhancement Course
VAC: Value Added Course
VEC: Value Education Course
IKS: Indian Knowledge System
OE: Open Elective

SEMESTER I

BOS	**Mathematics, Statistics and Computer Application**				
Course	**Introduction to Python Programming**				
Course Code	**HUSDS101**	**Level**	**4.5**		
			Theory	**Practical**	**Total**
Semester	**I**	**Credits**	2	1	3
Type	**Major**	**No of Teaching hours**	30	30	60

Evaluation/ Assessment	**Total Marks**	**Semester End**	**Continuous**	**Practical**
	150	**50**	**50**	**50**

Learning Objectives	
1	To learn Programming fundamentals using Python
2	To understand the concept of data types and other basic elements in python.
3	To learn control statements and operators in python.
4	To learn to write different functions and strings in python.
5	To understand the concept of dictionaries in python.
6	To understand the concept of the built -in module in python.

Course Outcomes	
CO1	Demonstrate the use of variables, data types, and input/output functions in Python programming.
CO2	Apply control statements and operators to implement logical and conditional operations in Python.
CO3	Explain and utilize dictionaries for storing and retrieving data efficiently.
CO4	Develop Python programs using functions and string operations for modular and efficient coding, concept of modules and use standard and custom modules in Python programs.

Modules At Glance

Module No.	**Content**	**No. of Hours**	**Mapping with CO**
I	Python Fundamentals and Programming Concepts	15	CO1, CO2, CO3
II	Operators, Arrays, Strings, Dictionaries and Built in Modules	15	CO4
		30	

Syllabus

Module No.	Content	No. of Lectures
I	**1.Introduction to Python Language:** Overview, Features of Python, Execution of a Python Program, Innards of Python, Frozen Binaries, Python Interpreter, Comparison of Python with C and Java, Installing Python, Writing & Executing, IDLE **2.Data Types, Variables and Other Basic Elements:** Comments, Docstrings, Data Types-Numeric, Compound, Boolean, Dictionary, Sets, Mapping, Basic Elements of Python, Variables. **3.Input and Output Operations:** Input Function, Output Statements, Command Line Arguments Control Statements: Control Statements- Loop Statement, the else Suite, break Statement, continue Statement, pass Statement, assert Statement, return Statement. **4.Functions:** Defining & Calling a Function, Returning Results, Returning Multiple Values, Built in Functions, Parameters and Arguments, Recursive Functions, Anonymous or Lambda Functions.	15
II	**1.Operators:** Arithmetic operator, Assignment operators, Unary minus operator, Relational operators, Logical operators, Bitwise operators, Membership operators, Identity operators, Precedence of Operators, Associativity of Operators. **2.Arrays:** Creating Arrays, Indexing and Slicing, Basic Array Operations, Arrays Processing, Mathematical Operations on Array, Aliasing Arrays, Slicing and Indexing in NumPy Arrays, Basic Slicing. Advanced Indexing. Dimensions of Arrays, Attributes of an Array. **3.Strings:** Creating Strings, Functions of Strings, Working with Strings, Length of a String, Indexing & Slicing, Repeating & Concatenation of Strings, Checking Membership, Comparing Strings, Removing Spaces, Finding Substrings, Counting Substrings, Strings are Immutable, Splitting and Joining Strings, Changing Case, Checking Starting and Ending of a String, Sorting & Searching in the Strings, Formatting the Strings, Working with Characters. **4.Built in Modules:** Importing modules in python program, Working with Random Modules'. - built-ins, time, date time, calendar, sys, etc.	15
Case Study Scenario		
M1	Modern libraries require computerized systems to manage books, track users, and monitor book issuance. This case study describes the theoretical design of a Library Book Management System (LBMS) using Python. It integrates Python fundamentals such as data types, operators, input/output, control statements, functions, strings, arrays, and modules.	
M2	Hospitals need efficient systems to schedule appointments, store patient information, track diagnosis details, and record doctor availability. Python can be used to design a simple Hospital Patient Information and Appointment Management System. This case study demonstrates how Python fundamentals support healthcare operations.	

References Books

1. Programming through Python M. T. Savaliya, R.K Maurya, G.M Magar, Staredu Solutions, 1st edition (2018)
2. Python DataScience Handbook, Jake VanderPlas, O'Reilly Media, 1st edition (2016)
3. Let Us Python, Yashwant Kanetkar, BPB publication , 1st edition (2019)
4. Programming in Python 3, Mark Summerfield, Pearson Education, 2nd edition (2018)
5. Learning Python, LutzM, O'Reilly- Shroff, 5th edition, 2013.

Semester End Evaluation (50 Marks) **Time: 2 Hr**

Paper Pattern

Question No	Questions	Total Marks: 50
Q1	Attempt any 3 out of 5	**15**
Q2	Attempt any 3 out of 5	**15**
Q3	Attempt any 3 out of 5	**15**
Q4	Case Study	**05**

Practical Syllabus

Sr. No.	List of practical	No. of Lectures	Mapping with CO
1.	**a.** Write a Python program using various datatypes and check their types. **b.** Write a Python program to perform Input and Output operations (accept a message and display it).	3	CO1
2.	**a.** Write a Python program to check whether an entered number is Armstrong or not using a while loop. **b.** Write a Python program to demonstrate the use of break and continue statements in loops..	3	CO1
3.	**a.** Write a Python program to check whether a number is even or odd. **b.** Write a Python program to find the largest among three numbers.	3	CO1
4.	**a.** Write a Python program to convert Celsius to Fahrenheit. **b.** Write a Python program to make a simple calculator (addition, subtraction, multiplication, division).	3	CO1
5.	**a.** Write a Python program to find HCF (GCD) of two numbers. **b.** Write a Python program to convert a decimal number to binary, octal, and hexadecimal.	3	CO2
6.	**a.** Write a Python program to add two numbers. **b.** Write a Python program to calculate the area of a triangle.	3	CO3
7.	**a.** Write a Python program to apply indexing and slicing on an array. **b.** Write a Python program to add and remove elements from an array.	3	CO3
8.	**a.** Write a Python program to demonstrate string immutability and use a multiline string. **b.** Write a Python program to compare and concatenate two strings.	3	CO4
9.	**a.** Write a Python program to remove punctuation from a string. **b.** Write a Python program to check whether a string is palindrome or not.	3	CO4
10.	**a.** Write a Python program to swap two variables. **b.** Write a Python program to shuffle a deck of cards. **c.** Write a Python program to import built in and user defined modules.	3	CO4, CO5

Practical Evaluation (50 Marks) **Time: 2 Hr.**

Question No.	Questions	Total Marks: 50
Q1.	Practical (Module 1 & Module 2)	30
Q2.	Journal	10
Q3.	Viva & Attendance	10

BOS	**Mathematics, Statistics and Computer Application**				
Course	**R Programming**				
Course Code	**HUSDS102**	**Level**	**4.5**		
			Theory	**Practical**	**Total**
Semester	**I**	**Credits**	2	1	3
Type	**Major Mandatory**	**No of Teaching hours**	30	30	60

Evaluation/ Assessment	**Total Marks**	**Semester End**	**Continuous**	**Practical**
	150	**50**	**50**	**50**

Learning Objectives	
1	Introduce basic R programming concepts and syntax.
2	Develop skills in data input, cleaning, and manipulation using R.
3	Familiarize students with R packages for data analysis and visualization.
4	Enable students to perform basic statistical computations in R.
5	Prepare students for using R in more advanced data science coursework.

Course Outcomes	
CO1	Students will be able to write basic R code to perform calculations and data manipulation
CO2	Students will be able to import, clean, and prepare data for analysis in R
CO3	Students will be able to use R packages to create basic data visualizations
CO4	Students will be able to perform descriptive statistical analysis using R, apply R programming skills to solve simple data-related problems.

Modules At Glance

Module No.	**Content**	**No. of Hours**	**Mapping with CO**
I	Introduction to R Programming	15	CO1, CO2
II	R for Data Analysis	15	CO3, CO4
		30	

Syllabus

Module No.	Content	No. of Lectures
I	**Introduction to R Programming** 1. **R Basics:** Interface, data types, variables, operators, types of R objects, Attributes of R Objects, operators, Creating and accessing objects, Modifying elements, control flow (if/else, loops). Functions: Built-in functions, user-defined functions 2. **R Data Structures:** Vectors, Lists, Matrices, Arrays, Factors, Data frames **3. R Packages:** Introduction to installing and using packa**ges** Data Input/Output: Importing data, reading data from files, writing data to files. 4. **Working with Strings** – string: Counting String Patterns, Splitting Strings, Capitalizing Strings, Wrapping, Padding, and Trimming, Detecting Substrings, Extracting Substrings, Transforming Strings. 5. **Working with Dates** – lubridate: Time Points, Time Zones, Time Intervals	15
II	**R for Data Analysis** 1. **Data Manipulation and Preparation:** Importing and exporting data in R, Data cleaning and preparation with dplyr, Data transformation using tidyr 2. **Descriptive Statistics:** Mean, median, standard deviation, Linear and multiple regression,etc. in R 3. **Data Visualization:** Basic plots (histograms, scatter plots, box plots) using R. Principles of effective data visualization, Introduction to ggplot2 and advanced visualization techniques 4. **Data Cleaning:** Handling missing values, data transformation 5. **Object Oriented Concept:** The S3 system, attributes, generic functions, methods, classes, S3 and debugging 6. **Applications of R in Data Science:** Examples	15
Case Study Scenario		
M1	**E-commerce Customer Purchase Analysis** Scenario: An online retail store wants to understand the purchasing behavior of its customers. They have a dataset named transactions.csv containing information about each transaction, including CustomerID, Date, Product_Category, and Purchase_Amount. The goal is to identify which product categories generate the most revenue.	
M2	**Student Academic Performance Analysis** Scenario: A school administrator wants to analyze the performance of students in different subjects. They have a dataset in an Excel file named student_grades.xlsx which contains StudentID, Subject, Final_Grade, and Hours_Studied. The goal is to visualize the grade distribution for a specific subject and explore the relationship between hours studied and final grades.	

References Books

1. Hands-On Programming with R, Garrett Grolemund, O'Reilly, 2014
2. R Programming: A Step-by-Step Guide for Absolute Beginners. Daniel Bell, Guzzler Media, 2020
3. **R for Data Science – Wickham & Grolemund**: Data manipulation, visualization, strings, dates, and data science workflows.
4. **The Art of R Programming – Norman Matloff**: R basics, data structures, functions, and S3 OOP.
5. **Hands-On Programming with R – Garrett Grolemund**: Introductory R programming with practical examples.

Semester End Evaluation (50 Marks) **Time: 2 Hr.**

Paper Patter

Question No	Questions	Total Marks: 50
Q1	Attempt any 3 out of 5	**15**
Q2	Attempt any 3 out of 5	**15**
Q3	Attempt any 3 out of 5	**15**
Q4	Case Study	**5**

Practical Syllabus

Sr. No.	List of practical	No. of Lecture	Mapping with CO
1	**Introduction to R Programming Elements** a.Write an R Program to implement expressions, assignment and decision making b.Write an R Program to design and implement loops. c.Write a R program to demonstrate the use of essential data structures in R [Hint: Vectors, Matrix, Arrays]	3	CO1
2	**Using List, Data Frames and Functions in R** a.Write an R program to manage data and exhibit operations on it using List data structure b.Write an R program to manage data and exhibit operations on it using Data Frames c.Write an R program to demonstrate the use of : i.user-defined functions ii.built-in numeric function, character functions etc.	3	CO2
3	**Implementing Strings in R** a.Write an R program to store and access string in R objects(vectors, matrix, arrays, data frames, and lists) b.Write an R program to demonstrate use of various string manipulation functions. [Hint: paste(), print(), noquote(),format(), cat(), toString(), sprint()]	3	CO2
4	**Performing Statistics with R-I** a.Write an R program to apply built-in statistical functions. [Hint: mean, median, standard deviation and others] b.Write an R program to demonstrate Linear and Multiple Regression analysis.	3	CO4
5	**Performing Statistics with R-II** a. Write an R program to implement i.Normal Distribution. [Hint: dnorm(), pnorm(), qnorm(), rnorm()] Binomial Distribution: [Hint: dbinom(), pbinom(),qbinom(),rbinom()]	3	CO4
6	**Data Visualization and Analysis** Write an R program to demonstrate various ways of performing Graphical analysis.	3	CO3
7	Object Oriented Programming in R Write an R program to demonstrate OOP concepts, the construction and use of S3 class.	3	CO3
8	**Data Interfaces in R** a.Write an R program to demonstrate data interface with CSV files [Hint: creating data for CSV, analyzing, writing CSV files] b.Write an R program to work with spreadsheet (Excel) programs. [Hint: installing,loading, verifying, creating data for xlsx file]	3	CO5

9	**Managing Data in R** write a R program to manage data using dplyr Package[Hint: group by(), %>%,mutate(), rename(),arrange(), filter(), select()]	3	CO2
10	**Handling Errors in R** a.Write an R program to demonstrate various error messages in R Programming b.Write an R program to implement Error Handling in R [Hint: warning(),stop(),try(), tryCatch(), CallingHandlers()]	3	CO4

Practical Evaluation (50 Marks) **Time: 2 Hr.**

Question No.	Questions	Total Marks: 50
Q1.	Practical (Module 1 & Module 2)	30
Q2.	Journal	10
Q3.	Viva & Attendance	10

BOS	**Mathematics, Statistics and Computer Application**					
Course	**Descriptive Statistics**					
Course Code	**HUSDS103**	**Level**		4.5		
				Theory	**Practical**	**Total**
Semester	**I**	**Credits**		2	1	3
Type	**Minor**	**No of Teaching hours**		30	30	60
Evaluation/ Assessment	**Total Marks**	**Semester End**	**Continuous**	**Practical**		
	150	50	50	50		

Learning Objectives	
1	To understand different types of Data, and to analyze and present the data
2	To compute various Measures of Central Tendencies.
3	To compute various Measures of Dispersion.
4	To understand the concept of Skewness and Kurtosis.
5	To compute Correlation Coefficient for bivariate data and further apply the regression analysis.

Course Outcomes	
CO1	Able to organize, manage and present the data.
CO2	To understand the use Measures of Central Tendencies and Dispersion.
CO3	Able to understand and compute the consistent and inconsistent data
CO4	Able to identify the association between variables
CO5	Able to understand forecasting techniques and to find cause and effect relationship between variable through regression analysis.

Modules At Glance

Module No.	**Content**	**No. of Lectures**	**Mapping with CO**
I	1.1 Introduction of Statistics: 1.2. Measures of Central Tendencies: 1.3. Measures of Dispersion: 1.4. Raw and Central Moments, relation between Raw and Central moments, concept of Skewness and Kurtosis.	15	CO1, CO2, CO3
II	2.1. Correlation 2.2. Rank Correlation 2.3. Regression, 2.4 Relation between Correlation and Regression 2.5. Concept of multiple correlation 2.6. Concept of multiple regression and logistics regression	15	CO4, CO5
		30	

Syllabus

Module No.	Content	No. of Lectures
I	**1. Introduction of Statistics:** Meaning of Statistics, Importance of Statistics, Types of Characteristics, Different types of Scales: Nominal, Ordinal, Interval and ratio. Univariate frequency distribution of discrete and continuous variables and Cumulative frequency distribution. Data Presentation: Frequency Distribution, Histogram and Ogives Curves. **2. Measures of Central Tendencies:** Concept of Central Tendency, characteristics of good measures of Central Tendency, Positional Averages: Median, Mode, Partition values: Quartiles, Deciles and Percentiles -examples of ungrouped and grouped data **3. Measures of Dispersion:** Concept of Dispersion, Requirements of good measures of Dispersion, Absolute and Relative measures of Dispersion: Range, Quartile Deviation, Mean Absolute Deviation, Standard Deviation, Combined Standard Deviation-examples of ungrouped and grouped data **4. Raw and Central Moments**, relation between Raw and Central moments, concept of Skewness and Kurtosis.	15
II	**1.**Concept of Correlation, types and interpretation, Scatter Diagram, Product Moment Correlation Coefficient, and its properties **2.** Spearman' s Rank Correlation (with and without ties) **3.** Concept of Linear Regression, Principle of Least Square, Fitting a straight line by method of least square. **4.** Difference between Correlation and Regression, relation between Correlation and Regression **5.**Concept of multiple correlation **6.** Concept of multiple regression and logistics regression	15
Case Study Scenario		
M1	A retail company collects data on customer age, product type and monthly spending to understand buying behavior. The data is classified using appropriate scales and organized into frequency and cumulative frequency distributions. Graphs such as histograms and ogives are used for presentation, and measures of central tendency like mean, median, mode, quartiles and percentiles are applied to identify average spending patterns and compare different customer groups.	
M2	A college analyzes the performance of students by studying the relationship between study hours and marks. Measures of dispersion and moments are used to understand variability and distribution shape. Correlation and regression techniques are applied to determine and predict the relationship between variables, including the effect of multiple factors such as attendance and internal marks on overall academic performance.	

References Books:

1. Sarma, K. V. S. (2001). Statistics Made it Simple: Do it yourself on PC. Prentce Hall of India, NewDelhi.
2. Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, NewDelhi.
3. Purohit, S. G., Gore S. D., Deshmukh S. R. (2008). Statistics Using R, Narosa Publishing House, NewDelhi.
4. Schaum‟s Outline Of Theory And Problems Of Beginning Statistics, Larry J. Stephens, Schaum‟s Outline Series Mcgraw-Hill

Semester End Evaluation (50 Marks) **Time: 2 Hr.**

Paper Patter

Question No	Questions	Total Marks: 50
Q1	Attempt any 3 out of 5	**15**
Q2	Attempt any 3 out of 5	**15**
Q3	Attempt any 3 out of 5	**15**
Q4	Case Study	**5**

Practical Syllabus

Sr. No	List of practical	Mapping with CO	No. of Lectures
1.	**Introduction to Excel** a. Understanding Data Tools. b. Understanding Formula Tools, insert functional library using insert function. c. Add-Ins Analysis tool packs d. Formula writing, Functions, using Cell reference, Sort, Filter and Advance Filter	CO1	3
2.	**Data Entry and Manipulation** a. Tools for data entry and accuracy: Quick Access toolbar customization, Form tool b. Data Transposition to fit Excel (as an Array) c. Data Conversion with the Logical If, VLOOKUP, Pivot table, Pivot chart. d. Data conversion to Text from Non-Excel Sources. Using text to Column	CO1	3
3.	**Data Validation** a. Specifying a valid range of values for a cell. b. Specifying a list of valid values for a cell c. Specifying custom validation based on formula for a cell.	CO1	3
4.	**Diagrams and Graphs** a. Excel program to plot Histogram. b. Excel program to plot Bar Graphs. c. Excel program to plot Pie chart. d. Boxplot and multiple Boxplots	CO1	3
5.	**Measures of Central Tendency** a. Excel program to find Mean. b. Excel program to find Median. c. Excel program to find Mode	CO2	3
6.	**Measures of Dispersion** a. Excel program to find Range, Interquartile Range b. Excel program to find Variance. c. Excel program to find Standard Deviation. d. Excel program to find Skewness and Kurtosis.	CO3	3
7.	**Correlation** a. Excel program to find Positive Correlation. b. Excel program to find Negative Correlation. c. Excel program to find Zero Correlation	CO4	3
8.	**Regression-1** a. Excel program to perform linear regression for prediction. b. Excel program to perform polynomial regression for prediction	CO5	3
9.	**Regression – 2** a. Excel program to perform multiple linear regression for prediction. b. Excel program to perform logistic regression for prediction	CO5	3
10.	Design a survey form, get primary data and analyse it. (given case study)	CO1, CO2, CO3, CO14, CO5	3

Practical Evaluation ***(50 Marks)*** **Time: 2 Hr.**

Question No.	Questions	Total Marks: 50
Q1.	Practical (Module 1 & Module 2)	30
Q2.	Journal	10
Q3.	Viva & Attendance	10

BOS	**Mathematics, Statistics and Computer Application**					
Course	**Excel for Business**					
Course Code	**HUSDS104**	**Level**		**4.5**		
				Theory	**Practical**	**Total**
Semester	**I**	**Credits**		2	1	3
Type	**SEC**	**No of Teaching hours**		**30**	**30**	**60**
Evaluation/ Assessment	**Total Marks**	**Semester End**	**Continuous**		**Practical**	
	150	**50**	**50**		**50**	

Learning Objectives	
1	Introduce participants to the fundamentals of spreadsheets and financial models.
2	Teach participants how to select the right tools for effective financial modelling.
3	Explore various types of financial models and their specific applications.
4	Explore advanced Excel functions relevant to financial modelling, to design professional financial dashboards using Excel, focusing on clarity, functionality, and visual appeal.

Course Outcomes	
CO1	Participants will gain a foundational understanding of spreadsheet structure and the components of financial models.
CO2	Participants will be able to create well-structured financial models, addressing common design challenges.
CO3	Participants will master Excel functions, shortcuts, cell referencing, and named ranges for efficient financial modelling.
CO4	Participants will gain expertise in formatting, using form controls, creating PivotTables, and employing various tools for effective financial modelling.
CO5	students will be able to design, build, and present professional dashboards that communicate financial insights visually and interactively.

Modules At Glance

Module No.	**Content**	**No. of Hours**	**Mapping with CO**
I	Module 1	15	CO1, CO2 & CO3
II	Module 2	15	CO4
		30	

Syllabus

Module No.	Content	No. of Lectures
I	**1.Financial Modelling:**Spreadsheet and a Financial Model, Types and Purposes of Financial Models, Tool Selection, Model Design, Design Issues, The Workbook Anatomy of a Model, Project Planning Your Model, Model Layout Flowcharting, Steps to Building a Model, Information Requests. **2.Using Excel in Financial Modelling:** Formulas and Functions in Excel, Handy Excel Shortcuts, Cell Referencing, Named Ranges, Basic Excel Functions, Logical Functions, Nesting Logical Functions. **3.Functions for Financial Modelling:**Aggregation & LOOKUP Functions, Nesting Index and Match, OFFSET Function, Regression Analysis, Choose Function, Working with Dates, Financial Project Evaluation Functions, Loan Calculations. **4.Tools for Model Display and Financial Modelling:** Basic Formatting, Conditional Formatting, Sparklines, Customizing the Display Settings, Form Controls, Hiding Sections, Grouping, Array Formulas, Structured Reference Tables, PivotTables, Macros.	15
II	**1.Stress Testing, Scenarios, and Sensitivity Analysis in Financial Modelling:**What are the Differences Between Scenario, Sensitivity, and What-If Analyses? Overview of Scenario Analysis Tools and Methods, Advanced Conditional Formatting, Comparing Scenario Methods, Adding Probability to a Data Table. **2.Presenting Model Output:** Preparing an Oral Presentation for Model Results, preparing a Graphic or Written Presentation for Model Results, Chart Types, Working with Charts, Handy Charting Hints, Dynamic Named Ranges, Charting with Two Different Axes and Chart Types, Bubble Charts, Creating a Dynamic Chart, Waterfall Charts, bullet charts. **3.Advanced Excel Dashboarding for Financial Modelling:** Principles of financial dashboard design, Dashboard use cases in financial modelling, Structuring data vs visuals vs controls, Using form controls (sliders, dropdowns, checkboxes), Dashboard filters using formulas & dropdowns, Data Validation and Error Checking for Dashboards, **4.Designing a dashboard:** Profit & Loss Overview, Cash Flow Dashboard, Budget vs Forecast dashboard.	15
Case Study Scenario		
M1	A small retail shop wants to create a simple financial model in Excel to predict monthly profit. They use basic formulas like SUM and IF to calculate revenue and expenses, and use VLOOKUP/INDEX-MATCH to pull product prices. Named ranges and cell referencing keep the sheet organized. Conditional formatting highlights low-profit months. This shows how basic Excel functions and proper model structure help build a clear financial model.	
M2	A company wants to study how changes in sales and cost affect profit. The analyst creates scenario and sensitivity analysis using data tables and applies conditional formatting to compare results. Charts and a small interactive dashboard with dropdowns help management visualize best-, base-, and worst-case outcomes. This shows how scenario tools, charts, and dashboards support better financial decision-making.	

References Books

1. Using Excel for Business and Financial Modelling: A Practical Guide, by Danielle Stein Fairhurst,
2. Wiley, 3rd Edition, 2019
3. Microsoft Excel Professional 2021 Guide: Complete Excel Reference, by CA Manmeet Singh Mehta, Paperback, 1st Edition, 2022
4. Microsoft Excel: Advanced Microsoft Excel Data Analysis for Business, by John Slavio, Hardcover, 1st Edition, 2019
5. Excel: Excel for Business, by Francesco Iannello, Createspace, 2016
6. https://www.w3schools.com/EXCEL/index.php

Semester End Evaluation (50 Marks) **Time: 2 Hr.**

Paper Patter

Question No	Questions	Total Marks: 50
Q1	Attempt any 3 out of 5	**15**
Q2	Attempt any 3 out of 5	**15**
Q3	Attempt any 3 out of 5	**15**
Q4	Case Study	**5**

Practical Syllabus

Sr. No.	List of practical	Mapping with CO	No. of Lectures
1	**Building a Simple Financial Model for Project Evaluation** a. Create a financial model with inputs such as initial investment, annual revenue, operating costs, and project duration. b. Use formulas such as NPV (Net Present Value), IRR (Internal Rate of Return), and Payback Period to evaluate the project. c. Add Conditional Formatting to highlight when the NPV is positive or negative.	CO1, CO2	3
2	**Sensitivity Analysis Using Data Tables** a. Create a simple profit model where inputs include sales volume, unit price, and interest rate. b. Use Data Tables to analyze how profit changes when different sales volumes and interest rates are used. c. Set up a two-variable data table: one for interest rates (row) and one for sales volume (column).	CO2, CO4	3
3	**VLOOKUP and INDEX/MATCH for Financial Data Analysis** a.Create a financial dataset with product names, sales, costs, and profit for multiple periods. b.Use **VLOOKUP** to retrieve the sales figures for a given product name and period. c.Use **INDEX/MATCH** to find the product with the highest profit for a specific period.	CO3	3
4	**PivotTable Analysis for Financial Summary** a. Create a dataset of sales data including sales region, product category, sales amount, and cost. b. Insert a **PivotTable** to analyze: ● Total sales by region and product category. ● Profit margin for each product category.	CO4	3
5	**What-If Analysis in Excel** a. Create a basic financial model (e.g., sales, costs, profit). b. Perform a sensitivity analysis by using the Data Table function to see how profit changes with different sales growth rates.	CO2, CO4	3
6	**What-If Analysis in Excel II** a. Build a scenario analysis using the Scenario Manager for three cases: Best, Base, and Worst Case (change multiple variables at once). b. Use What-If Analysis with Goal Seek to find out what sales are needed to achieve a specific profit target.	CO4	3
7	**Financial Charts** a. creates a line chart for analyzing revenue over 5 years. b. creates a waterfall chart for profit breakdown. c. creates a bullet chart for comparing actual vs target profit.	CO4	3

8	**Dynamic Financial Charts** a. Create a chart and implement dynamic named ranges so the chart updates based on user input (e.g., year, product line). b. Add form controls (dropdowns/sliders) to toggle between scenarios in the chart**.**	CO4	3
9	**Financial Dashboard Design** Build a simple and effective Profit & Loss dashboard.	CO4	3
10	**Interactive Dashboard with Filters and Validation** create a dynamic Excel dashboard where users can filter the data (e.g., by year or business unit), and ensure that all inputs are validated to prevent errors.	CO4	3

Practical Evaluation (50 Marks) **Time: 2 Hr.**

Question No.	Questions	Total Marks: 50
Q1.	Practical (Module 1 & Module 2)	30
Q2.	Journal	10
Q3.	Viva & Attendance	10

BOS	**Mathematics, Statistics and Computer Application**				
Course	**Indian Roots of Information Science**				
Course Code	**HUSDS105**	**Level**		**4.5**	
				Theory	**Total**
Semester	**I**	**Credits**		02	02
Type	**Major**	**No of Teaching hours**		**30**	**30**
Evaluation/ Assessment	**Total Marks**	**Semester End**	**Continuous**		**Practical**
	50	**-**	**50**		**-**

Learning Objectives	
1	To sensitize the students about context in which they are embedded i.e. Indian culture and civilization including its Knowledge System and Tradition.
2	To help students to understand the knowledge, art and creative practices, skills and values in the ancient Indian system.
3	To introduce the contribution from Ancient Indian system & tradition to modern science & Technology.

Course Outcomes	
CO1	Learners will understand and appreciate the rich Indian Knowledge Tradition.
CO2	Learner will understand the contribution of Indians in various fields & experience increased subject-awareness and self-esteem

Modules At Glance

Module No.	Content	No. of Hours	Mapping with CO
I	Introduction to Indian Knowledge System	15	CO1, CO2
II	Basics Applications inspired by IKS	15	CO2
		30	

Syllabus

Module No.	Content	No. of Lectures
I	**Introduction to Indian Knowledge System:** a. Introduction to IKS: What is knowledge System, Characteristic & Features of Indian Knowledge System b. Why IKS? Cultural Awareness and Pride, Holistic Learning, Preservation and Innovation c. Tradition & Scope of IKS: Vedas and Upanishads, Mathematics in Ancient India, Architecture & Vastu, Scope: Natural Language Processing (NLP), Artificial Intelligence & Machine Learning, Algorithm Optimization Inspired by Vedic Math d. History of Computers: Generations of Computers & Types of Computers	15
II	**Basic Applications inspired by IKS** e. Mathematics & Computation: Logic & Reasoning (Nyaya and Anuman) f. Binary Concepts using Vedic Mathematics g. Patterns & Algorithms (Chandaḥśāstra – Prosody) & Language Structure (Paninian Grammar): Patterns in poetic meters → similar to binary sequences, Application in text analysis and compression algorithms, Concepts of meta-rules → foundations of programming languages, Influence on Natural Language Processing (NLP) h. Time Representation & Calendars (Panchanga): Ancient Indian calendars use complex astronomical data, Concepts of time, cycles → used in simulations, data modeling i. Classification and Categories (Ayurvedic Ontologies): Tridosa and Disease Classification, Knowledge Management, Data Analysis, Tools and Technologies.	15

References Books

1. Concise history of science in India- D.M. Bose, S.N Sen, B.V. Subbarayappa.
2. Positive sciences of the Ancient Hindus- Brajendranatha seal, Motilal Banrasidas, Delhi 1958.
3. History of Chemistry in Ancient India & Medieval India, P.Ray- Indian Chemicals Society, Calcutta 1956
4. Charaka Samhita- a scientific synopsis, P. Ray & H.N Gupta National Institute of Sciences of India, New Delhi 1965.
5. MacDonnell A.A- History of Sanskrit literature

Continuous Evaluation: Internal (50 marks)

Sr. No.	Assessment/ Evaluation	Marks
1	Class test	15
2	Assignment and Presentation	15
3	Attendance & Class Participation	10
4	Quiz	10