MAZHARUL ULOOM COLLEGE
(AUTONOMOUS)

(Established & Managed by the Ambur Muslim Educational Society)
Accredited by NAAC with Grade 'A" CGPA 3.23 in Cycle 3
Affiliated to Thiruvalluvar University, Vellore
Ambur 635802 (Tirupattur District)

COURSE STRUCTURE & SYLLABUS

(For the students admitted from year 2025-2026 onwards)

Programme: B.Sc.

Course: DATA SCIENCE

At the end of the B.Sc. Data Science Programme, the student will:

Program Outcomes (POs)	
PO Code	**Program Outcome Statement**
PO1	Disciplinary Knowledge Acquire detailed knowledge and expertise in all the disciplines of the subject.
PO2	Communication Skills Ability to express thoughts and ideas effectively in writing, listening and confidently Communicate with others using appropriate media
PO3	Critical Thinking Students will develop aptitude Integrate skills of analysis, critiquing, application and creativity.
PO4	Analytical Reasoning Familiarize to evaluate the reliability and relevance of evidence, collect, analyzes and interprets data.
PO5	Problem Solving Capacity to extrapolate the learned competencies to solve different kinds of non-familiar problems.
PO6	Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
PO7	Moral and ethical awareness and Lifelong Learning: Upholds moral and ethical values, considers diverse perspectives on ethical issues, and applies ethical practices in all work. Committed to lifelong learning, career growth, and adapting to changing personal, professional, and societal needs.

After the successful completion of the programme, the students are expected to

Program Specific Outcomes (POs)	
PSO Code	**Program Specific Outcome Statement**
PSO1	Obtain ability to specify, design, develop, test and maintain usable software systems that behave reliably and efficiently and satisfy all the requirements that customers have defined for them.
PSO2	Gain skill to develop software systems that would perform tasks related to research, Education and training and /or E-Governance.
PSO3	Expertise in determining and optimizing the performance of a given algorithm on a given platform.
PSO4	Acquire capacity to anticipate the changing direction of information technology and evaluate and communicate the likely utility of new technologies to an individual or organization.
PSO5	Make the students capable in decision making at personal and professional level.

Cognitive Levels of Learning

The cognitive domain is the first and most common hierarchy of learning objectives (Bloom, 1956). It focuses on the acquisition and application of knowledge and is widely used in the educational setting. It aims to develop the mental skills and the acquisition of knowledge of the individual. The cognitive domain encompasses of six categories which include remembering, understanding, applying, analyzing, evaluating and creating.

Level	Definition	Key Actions
K1 : Remembering	Ability to recall or recognize facts, terms, basic concepts, or answers without necessarily understanding them.	Retrieve, Memorize, Repeat, Define, Identify, Recognize
K2 : Understanding	Comprehending the meaning of information, interpreting or translating knowledge into your own words.	Explain, Describe, Summarize, Interpret, Paraphrase
K3 : Applying	Using knowledge in new situations, such as solving problems or applying theories to real-world situations.	Use, Demonstrate, Implement, Calculate, Practice
K4 : Analyzing	Breaking information into parts to explore understandings and relationships; identifying motives or causes.	Compare, Contrast, Categorize, Distinguish, Examine, Organize
K5 : Evaluating	Making judgments based on criteria and standards, often involving checking and critiquing.	Judge, Critique, Justify, Assess, Prioritize, Recommend
K6 : Creating	Putting elements together to form a new coherent whole or original product.	Design, Develop, Invent, Compose, Construct, Generate

Department of Data Science

SYLLABUS AND SCHEME OF EXAMINATIONS – I & II SEMESTER

B. Sc(Data Science)									
Sem	**Course Code**	**Part**	**Course Category**	**Course Title**	**Ins. Hrs/ Week**	**Credit**	**Marks CIA**	**ESE**	**Total**
Semester I	URDU - 25BLU10 / TAMIL - 25BLT10	I	Language–I (Tamil / Urdu)	Urdu-I / Tamil-I	6	3	25	75	100
	25BLE10	II	English	English-I	6	3	25	75	100
	25BDS11	III	Core-I	Python Programming	5	5	25	75	100
	25BEDS12A	IV	Elective–I	a) Statistical Methods	4	3	25	75	100
	25BEDS12B			b) Numerical Methods-I					
	25BSDS13	IV	Skill Enhancement Course (SEC) - I	Web Development	2	2	25	75	100
	25BFDS14	IV	Foundation Course (FC)	Problem Solving Techniques	2	2	25	75	100
	25BPDS15	III	Core-II	Practical: Python Programming Lab	5	5	25	75	100
	Total				**30**	**23**			**700**
Semester II	URDU - 25BLU20 / TAMIL - 25BLT20	I	Language–II (Tamil / Urdu)	Urdu-II / Tamil-II	6	3	25	75	100
	25BLE20	II	English	English-II	6	3	25	75	100
	25BDS21	III	Core–III	Data Analytics	5	5	25	75	100
	25BEDS22A	IV	Elective–II	a) Inferential Statistics	4	3	25	75	100
	25BEDS22B			b) Numerical Methods-II					
	25BSDS23	IV	Skill Enhancement Course (SEC) - II	Fundamentals of Data Science	2	2	25	75	100
	25BSDS24	IV	Skill Enhancement Course (SEC)- III	Advanced Excel	2	2	25	75	100
	25BPDS25	III	Core–IV	Practical: Data Analytics Advanced Excel Lab	5	5	25	75	100
	Total				**30**	**23**			**700**

Semester - I

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	25BDS11	Core -I	5	5	25	75	100
Course Title	**PYTHON PROGRAMMING**						

Learning Objectives	
LO1	Understand the basic syntax, data types, operators, and expressions in Python programming.
LO2	Demonstrate control flow using conditional statements, loops, and jump statements in Python.
LO3	Define and use functions in Python, including different types of arguments and recursion.
LO4	Manipulate Python data structures such as strings, lists, tuples, and dictionaries effectively.
LO5	Perform file handling operations in Python, including reading, writing, appending, and managing files.

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Basics of Python Programming**: Features of Python – Literal –Constants – Variables – Identifiers – Key words- Built – in Data Types –Output Statements – Input Statements - Comments – Indentation - Operators - Expressions	15
II	**Control Statements**: Selection/Conditional Branching statements: if, if-else, nested if and if - elif- else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements	15
III	**Functions**: Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Key ordered Arguments, Default Arguments and Variable Length Arguments-Recursion.	15
IV	**Python Strings**: String operations- Immutable Strings – Built in String Methods and Functions - String Comparison**. Lists**: Creating a list – Access values in List - Updating values in Lists-Nested lists-Basic list operations - List Methods. **Dictionaries**: Creating, Accessing, Updating and Deleting Elements in a Dictionary–Dictionary Functions and Methods.	15
V	**Python File Handling**: Types of files in Python -Opening and Closing files-Reading and writing files: write( ) and write lines( ) methods- append() method–read() and read lines() methods – with keyword –Splitting words - File methods - File Positions – Renaming and deleting files.	15

Text Book(s):

1. Reema Thareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press.
2. Josef, J. & Lal, S. P. (2016). Introduction to Computing and Problem Solving with PYTHON, Khanna Book Publishing Co

Reference Book(s):

1. Vamsi Kurama, “Python Programming: A Modern Approach”, Pearson Education.

2. Dr.P.Rizwan Ahmed, Margham Publications, Chennai, 2023
3. Fabio Nelli, "Python Data Analytics", APress.
4. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication

Web Resource(s):

1. https://www.programiz.com/python-programming
2. https://www.guru99.com/python-tutorials.html
3. https://www.w3schools.com/python/python_intro.asp
4. https://www.geeksforgeeks.org/python-programming-language/
5. https://en.wikipedia.org/wiki/Python_(programming_language)

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO 1	Understand and explain the fundamental concepts of Python programming including data types, variables, operators, expressions, and basic input/output operations	K1,K2
CO 2	Implement control flow in Python programs using conditional statements, loops, and jump statements for decision-making and iteration.	K2,K3
CO 3	Design and develop modular Python programs using functions, including recursion and different types of function arguments.	K2,K3,K4
CO 4	Manipulate and manage Python data structures such as strings, lists, and dictionaries to solve real-world problems.	K3,K4,K5
CO 5	Perform file operations in Python including opening, reading, writing, appending, and managing files effectively for data processing tasks.	K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	2	2	3	3	2	3	3	2	2	3	2	2.50
CO 2	3	3	3	2	3	3	2	3	2	3	2	2	2.58
CO 3	3	3	3	3	3	2	3	3	2	3	2	2	2.67
CO 4	2	3	2	3	3	3	3	2	3	2	2	3	2.58
CO 5	3	2	3	3	3	3	3	3	2	3	3	3	2.83
											Mean Overall Score		2.63
											Correlation		High

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	25BPDS15	**Core -II**	5	5	25	75	100
Course Title	**PRACTICAL:PYTHON PROGRAMMING LAB**						

Learning Objectives	
LO 1	Be able to design and program Python applications.
LO 2	Be able to create loops and decision statements in Python.
LO 3	Be able to work with functions and pass arguments in Python.
LO 4	Be able to build and package Python modules for reusability.
LO 5	Be able to read and write files in Python

SYLLABUS

Unit	Contents	Hours

1. Write a program that:

- Declares variables for a student's name, roll number, and marks in 3 subjects.
- Uses literals (strings, integers, floats).
- Calculates the total and average marks using expressions.
- Displays the output using `print()` and includes comments explaining each part.

2. Create a program that:

- Takes two numbers from the user (input as strings).
- Converts them to integers (explicit type conversion).
- Performs arithmetic, relational, and logical operations.
- Displays the results with appropriate messages.

3. Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.
4. Write a Python program to:

- Create an array (list) of 5 integers.
- Access and print the first and last elements.
- Use array methods to append a new element and sort the array.
- Display the updated array.

5. Create a program that:

- Prints all numbers from 1 to 20 using a `for` loop.
- Skips even numbers using `continue`.
- Stops the loop if it encounters a number divisible by 13 using `break`.

6. Write a program that:

- Defines a function `calculate_area()` to calculate the area of a rectangle.

- Takes length and width as parameters.
- Returns the area.
- Demonstrates local and global variables.

7. Write a recursive function `is_palindrome(s)` that checks whether a string `s` is a palindrome.
8. Write a recursive function `count_vowels(s)` that counts the number of vowels (`a, e, i, o, u`) in a given string.
9. Create a **list** of 5 student names.

- Print the third student's name.
- Update the second student's name.
- Add a new student at the end.
- Display the final list.
- Create a nested list of student names and their grades. Access the grade of the second student.

10. Create a **tuple** of 4 colors.

- Access the first and last element.
- Convert it into a list and update the second color.
- Convert it back into a tuple.
- Create a nested tuple of fruit names and prices.

11. Create a **dictionary** of 3 students and their marks.

- Access the marks of one student.
- Update the marks of one student.
- Delete a student from the dictionary.
- Add a new student.
- Use any 2 dictionary methods (`keys()`, `values()`, `get()`, `items()`, etc.).

12. Write a program that:

- Opens a file named `students.txt` in write mode.
- Writes individual lines using `write()`.
- Writes multiple lines using `writelines()`.
- Closes the file

13. Write a program that:

- Opens the file `students.txt` created earlier.
- Reads and displays its content using `read()`.
- Then re-opens and displays the content using `readlines()` in a loop.

14. Write a program that:

- Opens `students.txt` in append mode and adds two more entries.
- Then reads all content, splits each line into words, and prints them.

15. Create a class `BankAccount` that demonstrates:

- Class definition and object creation.
- Private variables for account number and balance.
- Methods to deposit and withdraw money.

Text Book(s):

1. Reema Thareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.
1. Dr.P.Rizwan Ahmed, Python Programming, Margham Publications, Chennai, 2023
2. Josef, J. & Lal, S. P. (2016). Introduction to Computing and Problem Solving with PYTHON, Khanna Book Publishing Co

Reference Book(s):

2. .Vamsi Kurama, "Python Programming: A Modern Approach", Pearson Education.
3. Fabio Nelli, "Python Data Analytics", APress.
4. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication

Web Resource(s):

1. https://www.programiz.com/python-programming
2. https://www.guru99.com/python-tutorials.html
3. https://www.w3schools.com/python/python_intro.asp
4. https://www.geeksforgeeks.org/python-programming-language/
5. https://en.wikipedia.org/wiki/Python_(programming_language)

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO 1	Demonstrate the understanding of syntax and semantics of Python Programming	K1 to K5
CO 2	Identify the problem and solve using PYTHON programming techniques.	
CO 3	Identify suitable programming constructs for problem solving.	
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient Way.	
CO 5	Develop a PYTHON program for a given problem and test for its correctness.	

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	2	2	3	3	3	3	2	2	2	3	2.58
CO2	3	3	3	3	3	3	2	3	2	3	2	2	2.67
CO3	3	3	3	3	3	2	3	3	2	2	2	2	2.58
CO4	3	3	3	3	3	3	3	3	2	3	3	2	2.83
CO5	3	2	3	3	3	3	3	3	3	3	3	3	2.92
												Mean Overall Score	2.72
												Correlation	High

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	25BEDS12A	Elective - I	4	3	25	75	100
Course Title	**A) STATISTICAL METHODS**						

Learning Objectives	
LO1	Tell how descriptive and inferential statistics are used in the modern world
LO2	Show an understanding of Measures of location
LO3	Show an understanding of Measures of dispersion.
LO4	Show an understanding of Measures of Skewness.
LO5	Knowledge about Correlation and regression.

SYLLABUS		
Unit	Contents	Hours
I	Definition - scope and limitations of statistics- classification of data -Tabulation of data- Diagrammatic and Graphical representation of data - Graphical determination of Quartiles ,Deciles and Percentiles. O give curves and Lorenz curve	12
II	Measures of location: Arithmetic mean, median, mode, geometric mean and Harmonic mean and their properties.	12
III	Measures of dispersion: Range, Quartile deviation, mean deviation, Standard deviation, combined Standard deviation and their relative measures-Coefficient of mean deviation	12
IV	Measures of Skewness: KarlPearson's,Bowley's, andkelly'sandco- efficient of Skewness-kurtosmoments.-skewness and kurtosis based on moments.	12
V	Correlation - Karl Pearson's coefficient of correlation – Spearman's Rank correlation - Regression Equations.	12

Note: The proportion between theory and problems shall be 20:80

Text Book(s):
Mathematical Statistics-P.R.Vittal-Margham Publications Chennai.
Reference Book(s):
1. Fundamental of Mathematical Statistics- S.C.Gupta&V.K.Kapoor- Sultan Chand&Sons -Delhi. 2. Statistical Methods-Dr.S.P.Gupta-Sultan Chand &Sons-Delhi. 3. Business Statistics -P.A.Navnitham –Jai Publication-trichy. 4. Statistics-R.S.N.Pillai and Bagavathi-Sultan Chand-Delhi. 5. ElementsofStatistics-Mode.E.B.-Prentice Hall
Web Resource(s):
https://www.simplilearn.com/what-is-statistical-analysis-article

Course Outcomes
Upon successful completion of this course ,the student will be able to:

CO No.	CO Statement	Cognitive Level (K-Level)
CO 1	Understand the scope, classification, tabulation, and graphical representation of data using tools such as ogive curves, Lorenz curves, and graphical computation of quartiles, deciles, and percentiles.	K1,K2,K3
CO 2	Compute and analyze various measures of central tendency including mean, median, mode, geometric mean, and harmonic mean, and explain their properties and applications.	K1,K2,K3
CO 3	Calculate and compare different measures of dispersion such as range, quartile deviation, mean deviation, standard deviation, and their relative measures like coefficients	K2,K3,K4
CO 4	Analyze skewness and kurtosis using Karl Pearson's, Bowley's, and Kelly's coefficients, and apply moment-based methods to assess data symmetry.	K3,K4,K5
CO 5	Apply correlation methods such as Karl Pearson's and Spearman's rank correlation, and formulate regression equations for data analysis and prediction.	K2,K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	2	2	2	2	3	2	2	2	3	2	2.25
CO2	3	3	3	2	3	3	3	3	2	2	3	2	2.67
CO3	3	3	3	3	3	3	3	3	3	2	2	3	2.83
CO4	3	3	3	3	3	3	3	2	3	3	2	3	2.83
CO5	3	3	3	3	3	3	3	3	2	3	2	3	2.83
											Mean Overall Score		2.68
											Correlation		High

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	25BEDS12B	Elective - I	4	3	25	75	100
Course Title	**B) NUMERICAL METHODS-I**						

Learning Objectives	
LO1	To understand the principles of least squares and apply them to fit linear, polynomial, and exponential curves to data sets.
LO2	To develop proficiency in solving algebraic and transcendental equations using numerical methods effectively.
LO3	To enable students to solve simultaneous linear equations using direct and iterative techniques efficiently.
LO4	To introduce the concept of interpolation with equal intervals and use Gregory-Newton forward and backward formulas for estimating values.
LO5	To equip students with skills to apply central difference interpolation formulas including Gauss, Stirling, and Bessel methods for accurate estimation.

SYLLABUS

Unit	Contents	Hours
I	**Curve Fitting- Principle of Least square** Fitting of straight line $Y = a\,x + b$, parabola $Y = a\,x^2 + b\,x + c$, exponential curves of forms $Y = a\,x^b$, $Y = a\,e^{bx}$, and $Y = a\,b^x$. Chapter 1 (Section 1.4 to 1.9)	12
II	**Solutions of algebraic and transcendental equations** Bisection method, Iteration method, Regula falsi method and Newton-Raphson's method. Chapter 3 (Section 3.1 to 3.4)	12
III	**Solution of Simultaneous linear equations** Direct method - Gauss elimination method, Gauss-Jordan method, Method of Triangularization. Iterative method– Gauss Jacobi, Gauss Siedel method. Chapter 4 (Section 4.1 to 4.4, and 4.7 to 4.8)	12
IV	**Interpolation with equal intervals** Operators $\Delta, \nabla$and E - relation between them. Gregory-Newton forward and backward interpolation formulas Chapter 5 (Section 5.1, 5.2), Chapter 6 (excluding 6.7)	12
V	**Interpolation with equal intervals** **Central differences formulae** Gauss forward and backward formulae, Stirling's formula and Bessel's formula Chapter 7 (Section 7.3 to 7.6	12

Text Book(s):

P. Kandasamy& K. Thilagavathy, Numerical Methods, S.Chan d& Co.

Reference Book(s):

1. M.K.Venkataraman, Numerical Methods, National publishers
2.Arumugam,Numerical Methods, Scitech publishers

Web Resource(s):

1. https://www.geeksforgeeks.org/program-for-gauss-siedel-method-computational-mathematics/
2. https://www.baeldung.com/cs/curve-fitting

Course Outcomes		
Upon successful completion of this course ,the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO 1	Apply least square methods to fit appropriate curves (linear, quadratic, exponential) to experimental data for analysis and prediction.	K1,K2,K3
CO 2	Solve algebraic and transcendental equations using bisection, iteration, regula falsi, and Newton-Raphson methods for engineering applications.	K1,K2,K3
CO 3	Compute solutions to systems of linear equations using Gauss elimination, Gauss-Jordan, triangularisation, and iterative methods effectively.	K2,K3,K4
CO 4	Perform interpolation using forward and backward Gregory-Newton formulas to estimate intermediate data points accurately.	K3,K4,K5
CO 5	Use central difference interpolation techniques such as Gauss forward and backward, Stirling, and Bessel formulas to determine unknown values with precision.	K2,K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	2	3	3	2	3	3	2	3	2	2	2.50
CO2	3	3	3	3	3	3	3	3	2	3	2	2	2.75
CO3	3	3	3	3	3	3	3	3	2	3	3	2	2.83
CO4	3	3	3	3	2	3	3	3	2	3	2	2	2.67
CO5	3	3	3	3	2	3	3	3	2	3	3	3	2.83
											Mean Overall Score		2.72
											Correlation		High

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	25BSDS13	**Skill Enhancement Course (SEC-I)**	2	2	25	75	100
Course Title	**WEB DEVELOPMENT**						

Learning Objectives	
LO 1	To understand the basic concept of HTML.
LO 2	To Enhancing the concept of lists and tables
LO 3	To understand the basic concept of PHP
LO 4	To enhancing the functions in PHP
LO 5	To understand the concept of files in PHP

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction: Web Basics: Internet–Web browsers—HTML Basics: Understanding tags-Tags for Document structure (HTML, Head, Body Tag).Block level text elements :Headings-<p> tag–Font-style elements	6
II	Lists: Types of lists- Other tags: Marquee, HR, BR- Using Images Creating Hyper-links-Tables: Creating basic Table, Table elements, Caption–Table and cell alignment– Row span, Col span–Cell padding.	6
III	- Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope - Basics -Syntax -Variable -Data Types -Operators-Conditional Statements –Looping.	6
IV	PHP Functions -PHP Functions -Creating an Array -Modifying Array Elements -Processing Arrays with Loops -Grouping Form Selections with Arrays -Using Array	6
V	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File -Managing Sessions and Using Session Variables	6

Text Book(s):

1. Dr.P.Rizwan Ahmed, Open Source Programming , Margham Publications, Chennai, 2017
2. Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.

Reference Book(s):

1. Thomas Michaud, “Foundations of Web Design: Introduction to HTML & CSS”
2. A Ravichandran , “Fundamentals of Information Technology”, Khanna Book Publishing

Web Resource(s):

1. https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2. https://www.w3schools.com/html/default.asp

Course Outcomes
Upon successful completion of this course, the student will be able to:

CO No.	CO Statement	Cognitive Level (K-Level)
CO 1	Knows the basic concept in HTML Concept of resources in HTML	K1,K2
CO 2	Knows the concept of lists and tables	K1,K2,K3
CO 3	Understand PHP basics and conditional statements.	K2,K3,K4
CO 4	Knows the basic concepts of functions and arrays	K2,K3,K4
CO 5	Concept of Files in PHP	K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	2	3	3	3	2	2	2	3	2.67
CO2	3	3	3	3	2	3	3	2	3	2	3	2	2.67
CO3	3	3	3	3	3	3	2	3	2	3	2	2	2.67
CO4	3	2	3	2	3	2	2	3	2	2	3	2	2.42
CO5	3	2	3	3	3	3	2	3	2	2	2	3	2.58
												Mean Overall Score	2.6
												Correlation	High

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	25BFDS14	Foundation Course (FC)	2	2	25	75	100
Course Title	PROBLEM SOLVING TECHNIQUES						

Learning Objectives	
LO 1	Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
LO 2	Implement different programming constructs and decomposition of problems into functions.
LO 3	Use data flow diagram, Pseudo code to implement solutions.
LO 4	Define and use of arrays with simple applications
LO 5	Understand about operating system and their uses

SYLLABUS		
Unit	Contents	Hours
I	**Introduction:** History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers - Software: System software and Application software - Programming Languages	6
II	**Data:** Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output-**Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages of flowcharts - flowchart symbols and types of flowcharts.	6
III	**Selection Structures:** Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. **Repetition Structures:** Counter Controlled Loops –Nested Loops– Applications of Repetition Structures.	6
IV	**Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.	6
V	**Data Flow Diagrams:** Definition, DFD symbols and types of DFDs. **Program Modules:** Subprograms-Value and Reference parameters- Scope of a variable - Functions –Recursion. **Files:** File Basics-Creating and reading a sequential file- Modifying Sequential Files.	6

Text Book(s):

1. Dr.P.Rizwan Ahmed, Problem Solving Techniques, Margham Publications, Chennai, 2024

Reference Book(s):

1. Stewart Venit, “Introduction to Programming: Concepts and Design”, Fourth Edition, 2010, Dream Tech Publishers.

Web Resource(s):

1. https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm
2. http://www.nptel.iitm.ac.in/video.php?subjectId=106102067
3. http://utubersity.com/?page_id=876

Course Outcomes		
Upon successful completion of this course,the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Study the basic knowledge of Computers. Analyze the programming languages.	K1,K2
CO2	Study the data types and arithmetic operations. Know about the algorithms. Develop program using flow chart and pseudocode.	K1,K2,K3
CO3	Determine the various operators. Explain about the structures. Illustrate the concept of Loops	K2,K3
CO4	Study about Numeric data and character-based data. Analyze about Arrays.	K2,K3,K4
CO5	Explain about DFD Illustrate program modules. Creating and reading Files	K2,K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	2	3	2	3	3	2	3	2	2	3	2.5
CO2	3	3	3	2	3	3	3	3	2	3	2	2	2.67
CO3	3	3	3	3	3	3	2	3	2	2	3	2	2.67
CO4	3	3	2	3	3	3	3	3	2	3	2	2	2.67
CO5	3	3	3	3	3	3	3	3	2	3	2	2	2.75
												Mean Overall Score	2.65
												Correlation	High

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

SEMESTER - II

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	25BDS21	Core–III	5	5	25	75	100
Course Title	**DATA ANALYTICS**						

Learning Objectives	
LO1	Understand big data platforms and challenges of conventional systems.
LO2	Apply statistical and machine learning techniques for data analysis.
LO3	Use supervised learning models like linear and multiple regressions.
LO4	Perform hypothesis testing and data analysis using R or Python.
LO5	Evaluate model performance using bias-variance and error estimation concepts.

SYLLABUS		
Unit	Contents	Hours
I	Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting – Modern data analytic tools,	15
II	Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics – Rule Induction	15
III	Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection ,	15
IV	Basic analysis techniques, Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Correlation analysis, Maximum likelihood test, Practice and analysis with R or Python	15
V	Bias, Variance, and model complexity, Bias-variance trade off, Optimism of the training error rate,Estimate of In-sample prediction error, Effective number of parameters	15

Text Book(s):

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.

Reference Book(s):

1. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets,Cambridge University Press, 2012
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014
3. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.

Web Resource(s):

1. https://www.tutorialspoint.com/big_data_analytics/index.htm
2. https://machinelearningmastery.com/supervised-learning-algorithms/
3. https://towardsdatascience.com/introduction-to-regression-analysis-64d9f4e5e4bf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO 1	Ability to select and implement machine learning techniques and computing environment that are suitable for the application.	K1,K2
CO 2	Ability to identify the characteristics of datasets and compare the trivial data and unstructured data	K1,K2,K3
CO 3	Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies	K1,K2,K3
CO 4	Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.	K2,K3,K4
CO 5	Ability to integrate machine learning libraries and mathematical and statistical tools with modern technologies	K2,K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	1	1	2	2	2	1	2	1	2	2	1	1.58
CO2	2	2	1	2	2	2	2	2	1	2	2	2	1.83
CO3	2	2	2	1	1	1	3	3	2	3	3	2	2.08
CO4	2	2	2	2	2	3	2	3	2	2	2	2	2.16
CO5	2	2	2	1	3	2	2	3	2	2	3	2	2.16
											Mean Overall Score		1.96
											Correlation		Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	25BPDS25	Core–IV	5	5	25	75	100
Course Title	DATA ANALYTICS USING ADVANCED EXCEL LAB						

Learning Objectives	
LO1	To enable students understands the basics of spread sheet.
LO2	To enhance the knowledge in usage of Excel
LO3	To provide knowledge in advanced excel
LO4	To enable students to apply excel in different management areas
LO5	: To make students use excel for research purpose.

SYLLABUS

Unit	Contents	Hours
I	Introduction to spreadsheets, Cells – name range – references – Creating and editing worksheets-Cell Formatting-Creating and using formulas and functions-Use of Macros –Sorting and querying data- usage of Paste special	15
II	Preparation of a table Using EXCEL e.g. Employees payroll, Sales data, Students marks and perform the functions (Total, Average, Percentage, conditional sum and show the results in chart)-Creating formulas for financial solutions.	15
III	Cell Referencing - Data Validation- Naming a Cell or Range of Cells (Name Manager).- Basic formulas (SUM, COUNTA, AVERAGE, MAX, MIN). Text Functions (RIGHT, LEFT, MID, SUBSTITUTE, FIND, LEN). Date Functions (TODAY, NOW, DAY, MONTH, YEAR, EDATE, EOMONTH, TEXT)	15
IV	Lookup Functions (VLOOKUP, HLOOKUP, MATCH, INDEX). - Logical Functions (IF, AND, OR). -Data Analysis Functions (SUMIF, SUMIFS, COUNTIF, COUNTIFS) - Conditional Formatting, Filtering and Sorting. - Graphs, Charts and Pivot Tables remove duplicates	15
V	Usage of Google drive – micro soft online surveys – sharing with the help of social media	15

Text Book(s):

1. 1. Beskeen, D, Microsoft Office 2013: Illustrated introductory, first course. Stamford, CT: Cengage Learning, 2013.
2. Rinkoo Jainn, A to Z of MS EXCEL, A Book for Learners and Trainers, Amazon Digital Services LLC - KDP Print US. 2021

Reference Book(s):

1. Introduction to Computers and Communications, Peter Norton-Sixth Edition-Tata McGraw Hill, 2009.
2. V.Rajaraman, Introduction to Information Technology, Prentice Hall India, 2008
3. Winston-Microsoft Office Excel Data Analysis and Business Modeling, First Edition, Prentice Hall India. 2007
4. David Whigham, Business Data Analysis Using Excel, Oxford University Press, first Indian Edition

Web Resource(s):

1. https://support.microsoft.com/en-us/excel
2. https://digital.com/excel-tutorials/
3. https://trumpexcel.com/learn-excel/

Course Outcomes		
Upon successful completion of this course ,the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO 1	Explain basic concepts of Excel and create/edit spreadsheet	K1,K2,K3
CO 2	Apply basic excel formula in various functional areas of management	K1,K2,K3
CO 3	Demonstrate knowledge in using advanced excel functions	K2,K3,K4
CO 4	Apply logical functions of Excel	K2,K3,K4
CO 5	Use online methods to conduct surveys.	K2,K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	3	2	3	3	3	3	2	3	2	2	2.58
CO2	3	3	3	2	2	3	3	2	2	2	3	2	2.5
CO3	3	3	3	3	3	3	3	3	2	3	2	2	2.75
CO4	2	3	3	3	3	3	3	3	2	2	3	2	2.67
CO5	3	3	2	3	3	3	3	3	2	3	2	2	2.67
										Mean Overall Score			2.63
										Correlation			High

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	25BEDS22A	Elective -II	4	3	25	75	100
Course Title	**A) INFERENTIAL STATISTICS**						

Learning Objectives	
LO 1	To increase the span of attention of concepts
LO 2	To link concepts related to one unit with other units
LO 3	Give clarity on the intended learning outcomes of the unit.
LO 4	To acquire knowledge about Test of Significance-
LO 5	Knowledge about Analysis of variance.

SYLLABUS		
Unit	Contents	Hours
I	**Curve Fitting** Least square method-fitting a straight line- y =a+bx –fitting a parabolic $y = ax^2+bx+c$ - $y = ae^{bx}$power curves $y = ax^b$ and $y = ab^x$	12
II	**Probability** Sample Space-events-Types of events- conditional events-disjoint events -Independent events-probability-Addition and Multiplication Theorem - Baye's Theorem	12
III	**Testing of Hypothesis** Sample and population-Types of sampling-large and small samples- parameter and statistics –sampling distribution-standard error-critical values-hypothesis type I and type II errors-level of significances Procedure for testing of hypothesis-large sample tests for mean and proportions	12
IV	**Test of Significance(Small Samples Tests)** Small sample tests using t, F and χ^2including Mean, proportions, test of independence and tests of goodness of fit	12
V	Analysis of variance–One and Two way classifications-Basic principle of design of Experiments Randomization, L.S.D.	12

Text Book(s):
Mathematical Statistics-P.R.Vittal-Margham publications Chennai.
Reference Book(s):
1. Fundamental of Mathematical Statistics- S.C.Gupta&V.K.Kapoor- Sultan Chand&Sons -Delhi. 2. Statistical Methods-Dr.S.P.Gupta-Sultan Chand &Sons-Delhi. 3.Statistics-R.S.N.Pillai and Bagavathi-Sultan Chand-Delhi 4. Statistical Methods-SnedecorG.W.&CochranW.G. oxford&+DII
Web Resource(s):
https://nptel.ac.in/courses/111107105

Course Outcomes		
Upon successful completion of this course ,the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Know and understand about Sample Space-events- probability	K1,K2,K3
CO2	Know and understand about Standard Probability distributions	K1,K2,K3
CO3	Know and understand about Test of Hypothesis	K2,K3,K4
CO4	Know and understand about Test of Significance	K2,K3,K4
CO5	Understand the Analysis of variance	K2,K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	2	3	3	3	3	2	3	2	3	2	2.58
CO2	3	3	2	3	2	3	3	2	2	3	2	3	2.58
CO3	3	3	3	3	3	3	3	3	2	2	3	2	2.75
CO4	3	3	3	3	3	3	3	3	2	2	2	3	2.75
CO5	3	3	3	3	3	2	3	3	2	2	3	2	2.67
	Mean Overall Score												2.67
	Correlation												High

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	25BEDS22B	Elective–II	4	3	25	75	100
Course Title	**B)NUMERICAL METHODS-II**						

Learning Objectives	
LO 1	To introduce the concept and application of interpolation techniques for equal intervals to estimate unknown data points.
LO 2	To develop the ability to perform numerical differentiation using finite difference formulas for practical problems.
LO 3	To provide knowledge on applying numerical integration methods to approximate definite integrals.
LO 4	To enable students to solve linear difference equations with constant coefficients for discrete systems analysis.
LO 5	To equip students with techniques for solving first order ordinary differential equations using various numerical methods effectively.

SYLLABUS

Unit	Contents	Hours
I	**Unit I: Interpolation with equal intervals** Newton's divided difference formula, Lagrange's Interpolation formula and Inverse Lagrange's Interpolation formula. Chapter 8 (Section 8.5 to 8.8)	12
II	**Unit II: Numerical Differentiation** Derivatives using Newton's Forward and Backward Difference Formulae Derivatives using Stirling's Formula - Derivatives using Divided Difference Formula - Maxima and Minima using the above Formulae. **Chapter9**:Section9.1to9.4&9.6	12
III	**Unit III: Numerical Integration** Trapezoidal Rule-Simpson's One-Third Rule - Simpson's Three-Eighth Rule - Weddle's Rule – Applications. **Chapter9**:Section9.9&9.13to9.15	12
IV	**Unit IV: Difference Equations** Linear Homogenous and Non Homogenous Difference Equation with constant coefficients-particular integrals for a^x, x^m, $\sin kx$, $\cos kx$, $a^x F(x)$. **Chapter10**:Section10.1to10.4&10.6	12
V	**Unit V: Numerical solution of Ordinary Differential Equations (I order only):** Taylor's series method- Picard's method, Euler's Method- Modified Euler's Method – Improved Euler's Method –Runge - Kutta Method (Fourth Order only). **Chapter11**	12

Text Book(s):
P. Kandasamy& K. Thilagavathy, Numerical Methods, S.Chan d& Co.
Reference Book(s):
1.M.K.Venkataraman, Numerical Methods, National publishers 2. Arumugam, Numerical Methods, Scitech publishers
Web Resource(s):
1.https://ece.uwaterloo.ca/~dwharder/NumericalAnalysis/14IVPs/rk/complete.html 2. https://www.atozmath.com/example/CONM/NumeDiff.aspx

Course Outcomes		
Upon successful completion of this course ,the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO 1	Apply interpolation formulas such as Newton's divided difference and Lagrange's to estimate values for tabulated functions.	K1,K2,K3
CO 2	Calculate numerical derivatives using forward, backward, Stirling, and divided difference formulas for function analysis.	K1,K2,K3
CO 3	Evaluate definite integrals using Trapezoidal, Simpson's (1/3 and 3/8), and Weddle's rules for engineering and scientific applications.	K2,K3,K4
CO 4	Solve linear difference equations with constant coefficients to analyze discrete time systems.	K2,K3,K4,K5
CO 5	Determine solutions of first order ordinary differential equations using Taylor's, Picard's, Euler's, Modified Euler's, Improved Euler's, and Runge-Kutta methods.	K2,K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	2	3	2	3	3	3	2	3	2	2	2.58
CO2	3	3	3	3	3	3	3	3	2	3	2	2	2.75
CO3	3	3	3	3	3	2	3	3	2	3	2	2	2.67
CO4	3	3	3	3	2	2	3	3	2	3	2	2	2.58
CO5	3	3	3	3	3	3	3	3	2	3	2	2	2.75
										Mean Overall Score			2.67
										Correlation			High

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	25BSDS23	Skill Enhancement Course (SEC) - II	2	2	25	75	100
Course Title	**FUNDAMENTALS OF DATA SCIENCE**						

Learning Objectives	
LO 1	To learn about basics of Data Science and Big data.
LO 2	To learn about overview and building process of Data Science.
LO 3	To learn about various Algorithms in Data Science.
LO 4	To learn about Hadoop Framework.
LO 5	To learn about case studies

SYLLABUS

Unit	Contents	Hours
I	**Introduction:** Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science	6
II	**The Data science process**:Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building .	6
III	**Algorithms** :Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised	6
IV	**Introduction to Hadoop** :Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types	6
V	**Case Study**: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation	6

Text Book(s):

1. Dr.P.Rizwan Ahmed, Introduction to Data Science, Margham Publications, Chennai. 2023
2. Roger Peng, “The Art of Data Science”, lulu.com 2016.

Reference Book(s):

1. Davy Cielen, Arno D.B. Meysman, Mohamed Ali,“Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools”, Dreamtech Press 2016.
2. Annalyn Ng, Kenneth Soo, “Numsense! Data Science for the Layman: No Math Added”, 2017,1st Edition.

Web Resource(s):

1. http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/
2. https://www.w3schools.com/datascience/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO 1	Understand the basics in Data Science and Big data.	K1,K2
CO 2	Understand overview and building process in Data Science.	K1,K2,K3
CO 3	Understand various Algorithms in Data Science.	K2,K3,K4
CO 4	Understand Hadoop Framework in Data Science.	K2,K3,K4,K5
CO 5	Case study in Data Science.	K2,K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	2	1	1	1	1	2	2	2	2	2	2	1.66
CO2	2	1	1	1	2	2	2	1	1	2	1	1	1.41
CO3	2	1	1	2	1	2	2	2	2	3	2	2	1.83
CO4	2	2	2	2	2	2	3	3	2	2	2	2	2.16
CO5	3	3	3	3	3	3	3	3	2	3	3	2	2.83
Mean Overall Score													1.98
Correlation													Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	25BSDS24	Skill Enhancement Course (SEC)- III	2	2	25	75	100
Course Title	**ADVANCED EXCEL**						

Learning Objectives	
LO 1	Understand basic Excel operations, including functions, cell references, and worksheet protection.
LO 2	Apply advanced `VLOOKUP` techniques with dynamic ranges and nested formulas.
LO 3	Use data validation and templates for structured and error-free data entry.
LO 4	Create and customize PivotTables and PivotCharts for data analysis.
LO 5	Design and format charts, including sparklines and dynamic visualizations.

SYLLABUS

Unit	Contents	Hours
I	Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match	6
II	Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLookUP to consolidate Data from Multiple Sheets	6
III	Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data -Sorting tables	6
IV	Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total	6
V	Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features Of Excel Sparklines, Inline Charts, data Charts	6

Text Book(s):

1. Microsoft Excel 2019 Data Analysis and Business Modeling, Wayne Winston, 2019

Reference Book(s):

1. Michael Alexander, Richard Kusleika, John Walkenbach, Microsoft Excel 2019 Bible, Wiley
2. Greg Harvey, *Excel 2021 for Dummies,* Wiley

Web Resource(s):

1. https://www.excel-university.com/conditional-formatting-with-data-validation/
2. https://support.microsoft.com/en-us/office/vlookup-function-0bbc8083-26fe-4963-8ab8-93a18ad188a1
3. https://www.ablebits.com/office-addins-blog/excel-data-validation-custom-formula/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO 1	Understand and apply basic Excel features such as cell referencing, worksheet protection, and built-in functions.	K1,K2
CO 2	Implement advanced lookup functions like nested and dynamic `VLOOKUP` for data retrieval and consolidation.	K1,K2,K3
CO 3	Use data validation techniques and templates to ensure accurate and standardized data entry.	K2,K3,K4
CO 4	Create, format, and analyze data using PivotTables, PivotCharts, and advanced summary options.	K2,K3,K4,K5
CO 5	Develop and customize various chart types, including sparklines and dynamic charts for effective data visualization.	K2,K3,K4,K5

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	1	1	1	1	2	1	1	1	2	2	1	2	1.33
CO2	2	2	2	2	1	2	2	2	2	1	1	2	1.75
CO3	3	2	2	2	3	3	2	3	2	2	2	2	2.33
CO4	3	2	2	2	2	2	2	2	2	3	2	2	2.16
CO5	3	2	3	2	2	2	2	3	2	2	2	2	2.25
												Mean Overall Score	1.96
												Correlation	Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<=1	Low
>1 & <=2	Medium
>2 & <=3	High