MARUDHAR KESARI JAIN COLLEGE FOR WOMEN (AUTONOMOUS)

Vaniyambadi – 635 751

Department of Data Science

For

Undergraduate Programme

Bachelor of Science in Data Science

From the Academic Year 2024-25

CONTENT

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE EDUCATION

1. Preamble

The B. Sc Data Science Programme equips students with the necessary abilities to pursue a successful career in the Analytics domain. The B. Sc Data Science Programme (NEP) is an Honors degree that spans six semesters over three years. Data science has emerged as a key sector of computer applications, with its popularity rapidly expanding. It is an interdisciplinary field that combines the magic of programming, mathematics, and commerce to produce something new. Marudhar Kesari Jain College for women has always strived to keep up with the quick pace of academic and industry innovations, which is why the college has developed a degree programme in B. Sc Data Science.

Data Science, when combined with Machine Learning, aids in the discovery of future trends that can be used to provide actionable insights for future impact. These qualities will help you to become a Data Scientist. As a Data Science aspirant, you will emphasise the importance of sharing knowledge in areas such as quantitative analysis, programming ideas, and business intelligence. Any company that can properly use data can profit from data science. Our students receive a broad education that includes a relevant modern industry-related curriculum, great problem-solving and communication skills, and the capacity to work in cross-disciplinary teams, all of which contribute to their spirit of invention and academic success. Students are also enhanced with information outside of the curriculum through different immersive and participatory learning opportunities such as value-added certificate courses, guest lectures, workshops, seminars, intra and inter-collegiate fests, science exhibitions, and industrial tours. This program provides learners with a solid foundation in the statistical underpinnings of data science, as well as the computing skills and algorithmic thinking essential for modern data analysis. Guest lectures, seminars, projects, internships, and other opportunities to expose students to research models and industry standard data science applications. The Department has formed Academic Alliances with several sectors to bridge the gap between academics and industry. Industries are ready to develop initiatives to overcome the current skill gap in innovative computing technologies. It contributes to ensuring the sector has a solid pipeline of graduates to meet future demands. The department also includes Knowledge Kindle Groups and Common Interest Groups, which allow students to network, discuss, and cooperate on their creative ideas. The department encourages students to engage in extended learning processes such as self-paced learning through various MOOC and NPTEL courses that interest them.

LEARNING OUTCOMES-BASED CURRICULUMFRAMEWORK FOR UNDERGRADUATE EDUCATION	
Programme	**B.Sc., Data Science**
Programme Code	**US04**
Duration	**3 years [UG]**
Programme Outcomes	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study. **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation. **PO7: Cooperation / Teamwork:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team. **PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence, and experiences from an open-minded and reasoned perspective.

Programme Specific Outcomes:	**PSO1.** Able to apply data analytical skills that rely on mathematical and statistical methods to solve problems in a data-driven world. **PSO2**. Able to analyze and interpret complex data to produce actionable insights. **PSO3**. Able to understand the nuances of data analytical skills to evolve innovative ideas and communicate the social relevance and impact of their analytical findings.

Eligibility for Admission:

Candidate for admission to the first year of (B.Sc., Data Science) Department of Data Science shall be required to have passed the Higher Secondary Examination with atleast any one of the subject as Maths and Computer Science

Methods of Evaluation and Assessment

Methods of Evaluation		
Internal Evaluation		25 Marks
External Evaluation	End Semester Examination	75 Marks
	Total	**100 Marks**
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand / Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, short summary or overview	
Application (K3)	Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, finish a procedure in many steps, Differentiate Between various ideas, Map knowledge	
Evaluate (K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations	

Semester - I						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA11	Tamil - 1	4	1	0	0	3
24UFEN11	English - 1	4	1	0	0	3
24UDSC11	CC – 1 Python Programming	3	1	2	0	5
24UDSC12P	CC - 2 (Practical) Python Programming Lab	0	0	4	0	3
24UMAA11 24UMAA12	EC - 1 AL (Choose one from the list) Numerical Methods –I Statistical Method and its Application- I	3	1	0	0	3
24UDSS11	SEC – 1Fundamentals of Information Technology	1	0	1	0	2
24UDSS12P	SEC – 2 Hands On Training on Excel	0	0	2	0	2
24UDSF11	FC Digital Computer Fundamentals	1	1	0	0	2
					30	23

Semester - II						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA21	Tamil - 2	4	1	0	0	3
24UFEN21	English - 2	4	1	0	0	3
24UDSC21	CC – 3 Data Structure	3	1	2	0	5
24UDSC22P	CC – 4 Data Structure Lab (Practical)	0	0	4	0	2
24UMAA25	EC - 2 AL (Choose one from the list) Numerical Methods – II Statistical Method and its Application- II	3	1	0	0	4
24UMAA25P	EC– 3 Numerical Methods Lab – II Statistical Method and its Application Lab - II	0	0	2	0	2
24UDSS21	SEC – 3 Web Technology	1	1	0	0	2
24UAEC21	AEC – 1 LIFE SKILL FOR YOGA	1	1	0	0	2
					30	23

L- Learning T-Tutorial P-Practical S-Seminar C-Credit

Students must complete at least one online course(MOOC) from platforms like SWAMYAM, NPTEL, or Nanmudhalvan within the fifth semster, Additionally, engaging in a specified Self Learning Course is mandatory to qualify for the degree, and successful participation will be acknowledged with an extra credit of 2*.

1ST YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UDSC11	**PYTHON PROGRAMMING**	**Core**	**3**	**1**	**2**	**0**	**5**	**6**	**25**	**75**	**100**

Learning Objectives	
LO1	To make students understand the concepts of Python programming.
LO2	To apply the OOPs concept in PYTHON programming.
LO3	To impart knowledge on demand and supply concepts
LO4	To make the students learn best practices in PYTHON programming
LO5	To know the costs and profit maximization

Unit	Content	Hours
1	Basics of Python Programming: History of Python-Features of Python- Literal-Constants-Variables - Identifiers–Keywords- Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. Python Arrays: Defining and Processing Arrays – Array methods.	14
2	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.	14
3	Functions: Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. Python Strings: String operations-Immutable Strings-Built-in String Methods and Functions-String Comparison. Modules: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.	14
4	Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.	14

5	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 readlines() methods – with keyword – Splitting words– File methods - File Positions- Renaming and deleting files.	**14**

CO	Course Outcomes
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.
CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.

Textbooks:	
1	Reema Thareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.
2	Dr. R. Nageswara Rao, "Core Python Programming", First Edition, 2017, Dream tech Publishers.
3	Introduction to Computer Programming with Python by Harris Wang Publisher: Athabasca University Press (September, 2023
4	Introduction to Python Programming by Udayan Das, et al. Publisher: OpenStax
5	Python Basics: A Practical Introduction to Python 3 Revised and Updated 4th Edition David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler Copyright © Real Python (realpython.com), 2012–2020
Reference Books:	
1	VamsiKurama, "Python Programming: A Modern Approach", Pearson Education.
2	Mark Lutz, "Learning Python", Orielly.
3	Adam Stewarts, "Python Programming", Online.
4	Fabio Nelli, "Python Data Analytics", A Press.
5	Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication.
Web resources:	
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)

Mapping with Programme Outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	3	3	2	3	2	2
CO3	3	3	3	3	3	3	3	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	12	15	12	12
Average	3	3	3	3	3	3	3	2	3	2	2

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

1ST YEAR: FIRST SEMESTER

CourseCode	CourseName	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UDSC12P	**PYTHON LAB**	**Practical**	**0**	**0**	**4**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	Be able to design and program Python applications.
LO2	Be able to create loops and decision statements in Python.
LO3	Be able to work with functions and pass arguments in Python.
LO4	Be able to build and package Python modules for reusability.
LO5	Be able to read and write files in Python.

Program	Content	Hours
1	Program using variables, constants, I/O statements in Python.	60
2	Program using Operators in Python.	
3	Program using Conditional Statements.	
4	Program using Loops.	
5	Program using Jump Statements.	
6	Program using Functions.	
7	Program using Recursion.	
8	Program using Arrays.	
9	Program using Strings.	
10	Program using Modules.	
11	Program using Lists.	
12	Program using Tuples.	
13	Program using Dictionaries.	
14	Program for File Handling.	

CO	Course Outcomes
CO1	Demonstrate the understanding of syntax and semantics
CO2	Identify the problem and solve using PYTHON programming techniques.
CO3	Identify suitable programming constructs for problem solving.
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.
CO5	Develop a PYTHON program for a given problem and test for its correctness.

Textbooks:	
1	Reema Thareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.
2	Dr. R. Nageswara Rao, "Core Python Programming", First Edition, 2017, Dream tech Publishers.
3	Introduction to Computer Programming with Python by Harris Wang Publisher: Athabasca University Press (September, 2023
4	Introduction to Python Programming by Udayan Das, et al. Publisher: OpenStax
5	Python Basics: A Practical Introduction to Python 3 Revised and Updated 4th Edition David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler Copyright © Real Python (realpython.com), 2012–2020
Reference Books:	
1	Vamsi Kurama,"Python Programming: A Modern Approach", Pearson Education.
2	Mark Lutz,"Learning Python",Orielly.
3	Adam Stewarts, "Python Programming",Online.
4	Fabio Nelli,"Python Data Analytics",A Press.
5	Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication.
Web resources:	
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)

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	2	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	14	15	15	15	14	15	15	14	15	15
Average	3	2	3	3	3	2	3	3	2	3	3

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

1ST YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UDSS11	**FUNDAMENTALS OF INFORMATION TECHNOLOGY**	**Core**	**1**	**0**	**1**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	Understand basic concepts and terminology of information technology.
LO2	Have a basic understanding of personal computers and their operation
LO3	Be able to identify data storage and its usage
LO4	Get great knowledge of software and its functionalities
LO5	Understand about operating system and their uses

Unit	Content	Hours
1	Introduction to Computers: Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer	**6**
2	Basic Computer Organization: Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.	**6**
3	Storage Fundamentals: Primary vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives	**6**
4	Software: Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w	**6**

5	Operating System: Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	**6**

CO	Course Outcomes
CO1	Understand the fundamentals of computer, hardware, software and Programming.
CO2	Understand the use of computer organization
CO3	Understand the storage fundamentals and its uses
CO4	Develop MS Office applications knowledge and skills
CO5	know basic components of an operating systems

Textbooks:	
1	Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
2	Computer Fundamentals, A. Goel, 2010, Pearson Education.
3	Fundamentals of Computers, P. K.Sinha & P. Sinha, 2007, BPB Publishers.
4	Introduction of Information System ALEXISLEON,
5	Introduction to Information Technologyby V. Rajaraman third edition, PHI Publishers.
Reference Books:	
1	IT Tools, R.K. Jain, Khanna Publishing House
2	Introduction to Information Technology, Satish Jain, Ambrish Rai & Shashi Singh, PaperbackEdition, BPB Publications, 2014.
3	Computer Basics Absolute Beginner's Guide, Windows 11 Edition: Now Covers Windows 11 Paperback – Import, 4 August 2022
4	Computer Basics: For A Literate Living Paperback – 1 January 2017by Bittu Kumar
5	Computer Fundamentals, A. Goel, 2010, Pearson Education.
Web resources:	
1	https://testbook.com/learn/computer-fundamentals
2	https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html
3	https://www.javatpoint.com/computer-fundamentals-tutorial
4	https://www.tutorialspoint.com/computer_fundamentals/index.htm
5	https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	3	3	2	3	2	2
CO3	3	3	3	3	3	3	3	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	12	15	12	12
Average	3	3	3	3	3	3	3	2	3	2	2

3 – Strong, 2- Medium, 1- Low

1ST YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UDSS12P	**HANDS ON TRAINING ON EXCEL**	**Practical**	**0**	**0**	**2**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	Identify the different components of the Excel worksheet.
LO2	Construct formulas to manipulate numeric data in an Excel Worksheet
LO3	Set up the chart function of Excel to represent numeric data in multiple formats.
LO4	Differentiate between formulas and functions in Excel.
LO5	Access and manipulate data using the database functions of Excel.

Unit	Content	Hours
1	Excel Worksheets and Workbooks: Labeling and Naming Worksheets and Workbooks, Adding, Deleting and Saving Worksheets and Workbooks, Reposition Worksheets, Inserting, Deleting, and Renaming Worksheets, CopyWorksheets, Printing a Workbook, Formatting a Worksheet, Adding Elements to aWorkbook, Protecting Worksheet and Workbook	60
2	Import external data, Creating a Table, Sorting Data into a Table, Data Validation,Consolidation1 - Defining Names in MS Excel, Macros: View Macros, Record Macros	
3	Formulas and Functions: Creating a Formula, Formula Auditing, Meaning and Advantages of functions, Insert function, Use relative References, MathematicalFunctions, Statistical Functions, Date & Time Functions	
4	Charts: Chart elements: Titles, legend, data labels, creating a New Chart,Formatting the Chat, Types of charts, Using Chart Template	
5	PivotTables: Creating a Pivot Table, Filtering and Sorting a Pivot Table, Using Slicers to manipulate Pivot Tables, Creating a Pivot Chart2 - Filtering Data: Creating a Custom Auto Filter, Using an Advanced Filter. Data Group, Ungroup and Subtotals- Range names and Filter date	

CO	Course Outcomes
CO1	Demonstrating the basic mechanics and navigation of an Excel spreadsheet.
CO2	Using clip art to enhance ideas and information in Excel worksheets.
CO3	Learning formulas, creating charts and graphs that can easily explain or simplify complex information or data.
CO4	Working knowledge of organizing and displaying large amounts and complex data.
CO5	Analyzing data using Pivot Tables and Pivot Charts.

Textbooks:	
1	"Microsoft Excel 2019 Step by Step" by Curtis Frye
2	"Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walken bach
3	MICROSOFT EXCEL 2019: DATA ANALYSIS&BUSINESS MODEL Paperback – 11 October 2019by L. Winston Wayne (Author)
4	Microsoft Excel Formulas & Functions for Dummies, 5ed Paperback – 1 November2020by Ken Bluttman (Author)
5	Mastering Advanced Excel Paperback – 21 July 2023by Ritu Arora (Author)
Reference Books:	
1	"Microsoft Excel Data Analysis and Business Modeling" by Wayne L. Winston:
2	Excel 2019 All-in-One For Dummies" by Greg Harvey:
3	Statistical Analysis with Excel for Dummies, 4ed Paperback – 1 December 2020by Joseph Schmuller (Author)
4	Excel for Beginners By M.L. Humphrey
Webresources:	
1	https://www.academia.edu/42074058/Excel_2019_BIBLE2.https://ptgmedia**.pearsoncmg.com/images/9780735681019/samplepages/9780735681019.pdf**
2	https://w3schools.com/Excel
3	https://excel-practice-online.com
4	https://www.zuaneducation.com/blog/best-resources-to-learn-excel-online/
5	https://www.udemy.com/course/excel-crash-course-full-tutorial

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	2	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	14	15	15	14	15	15	15	15	15	15	14
Average	2	3	3	2	3	3	3	3	3	3	2

3 – Strong, 2- Medium, 1- Low

1ST YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UDSF11	**DIGITAL COMPUTER FUNDAMENTAL**	**Core**	**1**	**1**	**0**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	Identify the logic gates and their functionality.
LO2	Perform number conversions from one system to another system.
LO3	Design basic electronic circuits (combinational circuits).
LO4	Understand the fundamental concepts of computers, algorithms, flowcharts and problem solving techniques.
LO5	Apply the basic knowledge of mathematical factoring methods to model an algorithm, flowchart for a given problem.

Unit	Content	Hours
1	Divisibility, LCM, HCF- Numbers, Decimals, Fractions, Powers -Profit, Loss -Simple interest and Compound interest -Speed, Distance, Time.	**6**
2	Coding -Decoding, Series-missing number, odd one out, Cause and Effect, Direction and Ranking, Blood relations.	**6**
3	NUMBER SYSTEM AND CODES: Decimal Numbers, Binary Numbers, Decimal to Binary Conversions, Binary Arithmetic, 1's and 2's complements of Binary Numbers, Signed Numbers, Arithmetic Operations with Signed numbers, Hexadecimal Numbers, Octal Numbers, DigitalCodes, Error Detection Codes.	**6**
4	LOGIC GATES: The Inverter, The AND gate, The OR gate, The NAND gate, NOR gate, TheExclusive–OR gate and Exclusive-NOR gate; Boolean Algebra and Logic Simplification – BooleanOperations and Expressions, Laws and Rules, DeMorgan's Theorems, Boolean Expressions andTruth Tables, The Karnaugh Map, SOP minimizations.	**6**
5	Factoring Methods: Finding the square root of a number, the smallest Divisor of an integer, the greatest common divisor of two integers, computing the prime factors of an integer, raising a number to a large power.	**6**

CO	Course Outcomes
CO1	Appreciate and understand the differences between hardware and software.
CO2	Analyze a given problem and develop an algorithm to solve the problem.
CO3	Improve upon a solution to a problem.
CO4	An ability to understand and appreciate Boolean algebraic expressions to digital design
CO5	Apply the basic knowledge of mathematical factoring methods to model an algorithm, flowchart for a given problem.

Textbooks:	
1	Quantitative Aptitude For All Competitive Exams by Dr. R.S. Aggarwal.
2	R.G.Dromey, "How to Solve it by Computer", Pearson Education India, 2008.
3	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introductionto Algorithms", 3rd Edition, The MIT Press Cambridge, Massachusetts London, England,2008.
4	Floyd, Thomas L, "Digital Computer Fundamentals", 10 th Edition, University Book Stall, 1997.
5	Malvino, Paul Albert and Leach, Donald P, "Digital Computer Fundamentals", 3 rd Edition, TMH, 1995.
Reference Books:	
1	Steven S. Skiena, "The Algorithm Design Module", 2nd Edition, Springer-Verlag LondonLimited, 2008.
2	Donald E. Knuth, The Art of Computer Programming", Volume 1: FundamentalAlgorithms, 3rd Edition, Addison Wesley Longman, 1997.
3	Donald E. Knuth, The Art of Computer Programming", Volume 2: SeminumericalAlgorithms, 3rd Edition, Addison Wesley Longman, 1998.
4	Greg Perry and Dean Miller, "C programming Absolute Beginner's Guide", 3rd edition,Pearson Education, Inc, 2014.
5	Bartee, Thomas C, "Digital Computer Fundamentals", 6th Edition, TMH, 1995.
Web resources:	
1	http://algorithmsforinterviews.com "Algorithms for Interviews"
2	https://www.geeksforgeeks.org/computer-fundamentals-tutorial/
3	https://www.tutorialspoint.com/computer_fundamentals/computer_websites.html
4	https://www.indiabix.com/
5	https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_useful_resources.html

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	3	3	2	3	2	2
CO3	3	3	3	3	3	3	3	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	12	15	12	12
Average	3	3	3	3	3	3	3	2	3	2	2

3 – Strong, 2- Medium, 1- Low

1ST YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UDSC21	DATA STRUCTURE AND ALGORITHM	Core	3	1	2	0	5	6	25	75	100

Learning Objectives	
LO1	To Understand the concept of ADTs
LO2	To learn linear Data Structure-lists, Stack, queues
LO3	To Understand the concept of ADTs
LO4	To learn linear Data Structure-lists, Stack, queues
LO5	To Understand the concept of graph ADTs

Unit	Content	Hours
1	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation singly linked lists-circular linked lists-doubly-linked lists-applications of lists- All operations-Insertion-Deletion-Merge - Polynomial Manipulation.	14
2	Stack ADT-Operations- Applications- Evaluating arithmetic expressions–Conversion of infix to postfix expression-Queue ADT-Operations- Circular Queue- Priority Queue- deQueue applications of queues.	14
3	Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary search tree ADT- Heap-Applications of heap.	14
4	Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal- Applications of graphs.	14
5	Searching: Linear search-Binary search- Sorting: Bubble sort-Selection sort-Insertion sort- Hashing: Hash functions-Separate chaining- Open Addressing-Rehashing Extendible Hashing.	14

CO	Course Outcomes
CO1	Understand the concept of ADT
CO2	Able to Design, implement, and analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications
CO3	Implement various tree structures to problem
CO4	Implement various graph structures to problem
CO5	Critically analyze the various sorting algorithms

Textbooks:	
1	Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", An Indian Adaptation, John Wiley Sons Inc., 2021.
2	"Data Structures and Algorithms in Python" by Michael T. Goodrich, Roberto Tamassia, and Michael H. Gold wasser
3	"Problem Solving with Algorithms and Data Structures using Python" by Brad Miller and David Ranum.
4	Reema Thareja, Python Programming using Problem Solving Approach, First Edition, Oxford Higher Education.
5	"Data Structures and Algorithms with Python" by Kent D. Lee and Steve Hubbard.
Reference Books:	
1	Dr.Basant Agarwal; Benjamin Baka, "Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7", Packt Publishing, 2018.
2	Magnus Lie Hetland, "Python Algorithms: Mastering Basic Algorithms in the Python Language", A press, 2014
3	Data Structures and Algorithms Using Python, Rance D. Necaise, JOHN WILEY & SONS, INC.
4	Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011.

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	2	3	3	2	2	3	3
CO3	3	2	3	3	3	3	3	3	3	2	2
CO4	3	3	3	3	2	3	3	2	2	3	3
CO5	3	2	3	3	3	3	3	3	3	2	2
Total	15	12	15	15	13	15	15	13	13	12	12
Average	3	2	3	3	3	3	3	3	3	2	2

3 – Strong, 2- Medium, 1- Low

1ST YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UDSC22P	**DATA STRUCTURE AND ALGORITHM USING PYTHON LAB**	**Practical**	**0**	**0**	**4**	**0**	**2**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To Understand the concept of ADTs
LO2	To learn linear Data Structure-lists, Stack, queues
LO3	To Understand the concept of linked list
LO4	To learn about the priority queue and sorting
LO5	To Understand the concept of tree and graph traversal

Unit	Content	Hours
1	Create a Python Program to Implement Singly Linked List	48
2	Create a Python Program to Implement Doubly Linked List	
3	Create a Python Program for Stack Implementation	
4	Create a Python Program for Queue Implementation	
5	Create a Python Program to implement tree traversal techniques	
6	Create a Python Program for Queue Implementation	
7	Write a Python program to demonstrate Breadth first search (BFS) algorithm	
8	Write a Python program to demonstrate Depth first search (DFS) algorithm	
9	Write a Python program to demonstrate Binary Search	
10	Write a Python Program to demonstrate the Bubble Sort	

CO	Course Outcomes
CO1	To Implement ADT for Linear Data Structure
CO2	Able to Apply the different Linear, Non-Linear data structures to the problems
CO3	Implement various tree structures to problem
CO4	Implement various graph structures to problem
CO5	Critically analyze the various sorting algorithms

Textbooks:	
1	"Problem Solving in Data Structures and Algorithms using Python" by Hemant Jain.
2	"Data Structures and Algorithms in Python" by Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser
3	"Problem Solving with Algorithms and Data Structures using Python" by Brad Miller and David Ranum.
4	ReemaThareja, Python Programming using Problem Solving Approach, First Edition, Oxford Higher Education.
5	"Data Structures and Algorithms with Python" by Kent D. Lee and Steve Hubbard.
Reference Books:	
1	Dr.Basant Agarwal; Benjamin Baka, "Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7", Packt Publishing, 2018.
2	Magnus Lie Hetland, "Python Algorithms: Mastering Basic Algorithms in the Python Language", A press, 2014
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4	Rance D. Necaise, "Data Structures and Algorithms Using Python", JohnWiley & Sons, 2011.

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	2	3	3	2	2	3	3
CO3	3	2	3	3	3	3	3	3	3	2	2
CO4	3	3	3	3	2	3	3	2	2	3	3
CO5	3	2	3	3	3	3	3	3	3	2	2
Total	15	12	15	15	13	15	15	13	13	12	12
Average	3	2	3	3	3	3	3	3	3	2	2

3 – Strong, 2- Medium, 1- Low

1ST YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UDSS21	**Web Technology**	**SEC-3**	**1**	**0**	**1**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the concept of web design
LO2	To understand various concepts in HTML
LO3	To understand the basics of CSS
LO4	To understand the basic concepts of XML
LO5	To develop dynamic web pages with usage of server-side scripting PHP

Unit	Content	Hours
1	**Introduction and Web Design:** Introduction to Internet, WWW and Web 2.0,History of WWW, Web protocols and Web servers, Web Browser Architecture, Web Design-Principles and Web site structure.	6
2	**HTML** Basics of HTML, HTML Tags and attributes, Meta tags, Character entities, hyperlink, lists, tables, images, forms, divs, XHTML -Basic structure of XHTML, Creating Links with the Element.	6
3	**CSS:** Basics of CSS, CSS properties for manipulating texts, background, colors, Gradients, Shadow Effects, borders, margins, paddings, transformations, transitions and animations, etc., CSS box modal , Positioning systems of CSS, CSS media queries.	6
4	**XML** Introduction to XML, Defining XML tags, their attributes and values, Document type definition, XML Schemas, Document Object model, XHTML Parsing XML Data – DOM and SAX parsers in java	6
5	**PHP** Introduction to PHP and its syntax, combining PHP and HTML, understanding PHP code blocks like Arrays, Strings, Functions, looping and branching, file handling, processing forms on server side, cookies and sessions.	6

CO	Course Outcomes
CO1	Develop Web pages using HTML
CO2	Develop Web pages using HTML, CSS and XML
CO3	Design dynamic web pages using Javascript
CO4	To design web page using javascript and XML
CO5	Create web application using PHP

Text books:	
1	Thomas A.Powell: HTML & XHTML" Fourth Edition, The Complete Reference
2	Ivan Bayross: Web enabled commercial application development using HTML,JavaScript,DHTML and PHP" 4th Edition
3	Robert W. Sebesta: Programming the World Wide Web, Eighth Edition, Pearson education, 2015.
4	Dayley Brad, Dayley Brendan,"AngularJS, JavaScript, and jQuery All in One", Sams Teach Yourself 1st Edition, Kindle Edition, 2015..
5	Deitel,nieto,Lin,Sandhu-"XML How to program"-Pearson.
Reference Books:	
1	M. Srinivasan: Web Programming Building Internet Applications, 3 rdEdition, Wiley India, 2009.
2	Jeffrey C. Jackson: Web Technologies-A Computer Science Perspective, Pearson Education, 7thImpression, 2012.
3	Chris Bates: Web Technology Theory and Practice, Pearson Education, 2012.
4	Raj Kamal: Internet and Web Technologies, McGraw Hill Education.
5	Ryan Benedetti, Ronan Cranley, Head First jQuery - A Brain-Friendly Guide, O'Reilly Media

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	2	3	3	2	2	3	3
CO3	3	2	3	3	3	3	3	3	3	2	2
CO4	3	3	3	3	2	3	3	2	2	3	3
CO5	3	2	3	3	3	3	3	3	3	2	2
Total	15	12	15	15	13	15	15	13	13	12	12
Average	3	2	3	3	3	3	3	3	3	2	2

3 – Strong, 2- Medium, 1- Low