

B.Sc. Computer Science

Syllabus

(For students admitted from 2023-2024 onwards)



Department of Computer Science
Bishop Heber College (Autonomous),

Nationally Re-accredited at the 'A' by NAAC with a CGPA of 3.58 out of 4

Recognized by UGC as “College of Excellence”

Tiruchirappalli 620017

(Applicable to Candidates admitted From the Academic Year (2023-2024) onward

Sem.	Part	Course	Course Title	Course Code	Hours / week	Credits	Marks		
							CIA	ESE	Total
I	I	Language I	பொதுத்தமிழ் I	U23TM1L1	6	3	25	75	100
	II	English I	Prose and Short Stories	U23EG1L1	6	3	25	75	100
	III	Core I	Python Programming	U23CS101	5	5	25	75	100
		Core Prac. I	Python Programming Lab	U23CS1P1	3	3	40	60	100
		Allied I	Numerical Methods	U23MAZY1	6	5	25	75	100
	IV	SEC I	Office Automation	U23CS1E1	2	2	25	75	100
		FC	Problem Solving Techniques	U23CS1N1	2	2	100	--	100
					30	23			
II	I	Language II	பொதுத்தமிழ் II	U23TM2L2	6	3	25	75	100
	II	English II	Poetry and Shakespeare	U23EG2L2	6	3	25	75	100
	III	Core II	Data Structure and Algorithms	U23CS202	5	5	25	75	100
		Core Prac. II	Data Structure and Algorithms Lab	U23CS2P2	3	3	40	60	100
		Allied II	Optimization Techniques	U23MAZY2	6	5	25	75	100
	IV	SEC II	Multimedia Systems	U23CS2E2	2	2	25	75	100
		SEC III	Web Designing	U23CS2S3	2	2	25	75	100
					30	23			
III	I	Language III	பொதுத்தமிழ் III	U23TM3L3	6	3	25	75	100
	II	English III	One Act Plays and Abridged Novel	U23EG3L3	6	3	25	75	100
	III	Core III	Database Management System	U23CS303	5	5	25	75	100
		Core Prac. III	Database Management System Lab	U23CS3P3	3	3	40	60	100
		Allied III	Digital Logic Fundamentals	U23CS3Y3	6	5	25	75	100
	IV	SEC IV	Advanced Excel	U23CS3S4	1	1	100	--	100
		SEC V	PHP Programming	U23CS3S5	2	2	25	75	100
		EVS	Environmental Studies	U23EST41	1	--	--	--	--
					30	22			
IV	I	Language IV	பொதுத்தமிழ் IV	U23TM4L4	6	3	25	75	100
	II	English IV	Language through Literature	U23EG4L4	6	3	25	75	100
	III	Core IV	Java Programming	U23CS404	5	4	25	75	100
		Core Prac. IV	Java Programming Lab	U23CS4P4	3	4	40	60	100
		Allied IV	Microprocessor and Microcontroller	U23CS4Y4	3	3	25	75	100
		Allied Prac. I	Microprocessor and Microcontroller Lab	U23CSPY5	2	2	40	60	100
	IV	SEC VI	Life Skills	U23CS4S6	2	2	100	--	100
SEC VII		Application Development for smart Environment	U23CS4S7	2	2	100	--	100	
EVS I		Environmental Studies	U23EST41	1	2	25	75	100	
					30	25			

v	III	Core V	Software Engineering	U23CS505	5	4	25	75	100
		Core VI	.NET Programming	U23CS506	5	4	25	75	100
		Core Prac. V	.NET Programming Lab	U23CS5P5	6	4	40	60	100
		Core Project	Core Project with Viva Voce	U23CS5PJ	4	3	40	60	100
		Elective I	Introduction to Data Science	U23CS5:A	4	3	25	75	100
		Elective II	Cloud Computing	U23CS5:B	4	4	25	75	100
	IV	VLO	Abundant Life	U23VLO51	2	2	100	--	100
			Human Values	U23VLO52					
		Core Internship	Internship/ Industrial Training(Summer)	U23CS5I1	--	2	100	--	100
					30	26			
vi	III	Core VII	Computer Networks	U23CS607	6	4	25	75	100
		Core VIII	Machine Learning	U23CS608	6	4	25	75	100
		Core Prac. VII	Machine Learning Lab	U23CS6P6	6	4	40	60	100
		Elective III	Big Data Analytics	U23CS6:A	5	3	20	80	100
		Elective IV	Cryptography	U23CS6:B	5	3	25	75	100
	V	SBA	Technical Communication for Computer Scientists	U23CS6N2	2	2	25	75	100
	VI	Extension Activity		U23ETA61	--	1	--	--	--
					30	21			
				Total Credits :		140			

Python Programming

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	Contents	No. of Hours
I	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.	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, 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.	15
IV	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.	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
TOTAL HOURS		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1, PO2, PO3, PO4, PO5, PO6

CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1, PO2, PO3, PO4, PO5, PO6
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.	
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”, APress.	
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)	

Python Programming Lab

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.

LAB EXERCISES

Required Hours

1. Program using variables, constants, I/O statements in Python.
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.

60

Course Outcomes

On completion of this course, students will

CO1	Demonstrate the understanding of syntax and semantics of PYTHON language
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.

Office Automation

Learning Objectives		
LO1	Understand the basics of computer systems and its components.	
LO2	Understand and apply the basic concepts of a word processing package.	
LO3	Understand and apply the basic concepts of electronic spreadsheet software.	
LO4	Understand and apply the basic concepts of database management system.	
LO5	Understand and create a presentation using PowerPoint tool.	
UNIT	Contents	No. of Hours
I	Introductory concepts: Memory unit– CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems & its features: DOS– UNIX–Windows. Introduction to Programming Languages.	6
II	Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets; Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing–Preview, options, merge.	6
III	Spreadsheets: Excel opening, entering text and data, formatting, navigating; Formulas–entering, handling and copying; Charts–creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.	6
IV	Database Concepts: The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive applications in query language (MS–Access).	6
V	Power point: Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition–Animation effects, audio inclusion, timers.	6
	Total	30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Possess the knowledge on the basics of computers and its components	PO1,PO2,PO3,PO6,PO8
CO2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1,PO2,PO3,PO6
CO3	Learn the concepts of Database and implement the Query in Database.	PO3,PO5,PO7
CO4	Demonstrate the understanding of different automation tools.	PO3,PO4,PO5,PO7
CO5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6,PO7,PO8

Text Book	
1	Peter Norton, “Introduction to Computers”–Tata McGraw-Hill.
Reference Books	
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGrawHill.
Web Resources	
1.	https://www.udemy.com/course/office-automation-certificate-course/
2.	https://www.javatpoint.com/automation-tools

Problem Solving Techniques

Learning Objectives		
LO1	Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.	
LO2	Implement different programming constructs and decomposition of problems into functions.	
LO3	Use data flow diagram, Pseudo code to implement solutions.	
LO4	Define and use of arrays with simple applications	
LO5	Understand about operating system and their uses	
UNIT	Contents	No. Of. 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: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software. Programming Languages: Machine language, Assembly language, High-level language, 4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.	6
II	Data: Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC). Structured Programming: Algorithm: Features of good algorithm, Benefits and drawbacks of algorithm. Flowcharts: Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts. Pseudocode: Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. Program design: Modular Programming.	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
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Study the basic knowledge of Computers. Analyze the programming languages.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Study the data types and arithmetic operations. Know about the algorithms. Develop program using flow chart and pseudocode.	PO1, PO2, PO3, PO4, PO5, PO6
	Determine the various operators.	PO1, PO2, PO3,

CO3	Explain about the structures. Illustrate the concept of Loops	PO4, PO5, PO6
CO4	Study about Numeric data and character-based data. Analyze about Arrays.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Explain about DFD Illustrate program modules. Creating and reading Files	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

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

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

Data Structure and Algorithms

Learning Objectives		
LO1	To understand the concepts of ADTs	
LO2	To learn linear data structures-lists, stacks, queues	
LO3	To learn Tree structures and application of trees	
LO4	To learn graph structures and application of graphs	
LO5	To understand various sorting and searching	
UNIT	Contents	No. of Hours
I	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation singly linked lists-circular linked lists-doubly-linked lists-applications of lists-Polynomial Manipulation- All operations-Insertion-Deletion-Merge-Traversal	15
II	Stack ADT-Operations- Applications- Evaluating arithmetic expressions – Conversion of infix to postfix expression-Queue ADT-Operations-Circular Queue- Priority Queue- dequeuer applications of queues.	15
III	Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary search tree ADT- Threaded Binary Trees-AVL Trees- B-Tree- B+ Tree – Heap-Applications of heap.	15
IV	Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal-Topological sort- Bi-connectivity – Cut vertex- Euler circuits-Applications of graphs.	15
V	Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions-Separate chaining- Open Addressing-Rehashing Extendible Hashing	15
Total		75
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO6
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
CO3	Describe the hash function and concepts of collision and its resolution methods	PO2,PO4
CO4	Solve problem involving graphs, trees and heaps	PO4,PO6
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO5,PO6
Text Book		
1	1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.	
2	Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition	
Reference Books		
1.	Thomas H.Cormen, Chales E.Leiserson, Ronald L.Rivest, Clifford Stein, “Introduction to Algorithms”, McGraw Hill 2009, 3rd Edition.	
2.	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education 2003	

Web Resources

1.	https://www.programiz.com/dsa
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	3	3
CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	13	13	15	14

Data Structure and Algorithms Lab

Learning Objectives		
LO1	To understand the concepts of ADTs	
LO2	To learn linear data structures-lists, stacks, queues	
LO3	To learn Tree structures and application of trees	
LO4	To learn graph structures and application of graphs	
LO5	To understand various sorting and searching	
Sl. No	Contents	No. of Hours
1.	Write a program to implement the List ADT using arrays and linked lists.	60
2.	Write a programs to implement the following using a singly linked list. <ul style="list-style-type: none"> • Stack ADT • Queue ADT 	
3.	Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).	
4.	Write a program to implement priority queue ADT.	
5.	Write a program to perform the following operations: <ul style="list-style-type: none"> • Insert an element into a binary search tree. • Delete an element from a binary search tree. • Search for a key element in a binary search tree. 	
6.	Write a program to perform the following operations <ul style="list-style-type: none"> • Insertion into an AVL-tree • Deletion from an AVL-tree 	
7.	Write a programs for the implementation of BFS and DFS for a given graph.	
8	Write a programs for implementing the following searching methods: <ul style="list-style-type: none"> • Linear search • Binary search. 	

9.	Write a programs for implementing the following sorting methods: <ul style="list-style-type: none"> • Bubble sort • Selection sort • Insertion sort • Radix sort. 	
Total		60
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO4,PO5
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1, PO4,PO6
3	Describe the hash function and concepts of collision and its resolution methods	PO1,PO3,PO6
4	Solve problem involving graphs, trees and heaps	PO3,PO4
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1,PO5,PO6
Text Book		
1	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.	
2	Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition	
Reference Books		
1	Thomas H.Cormen, Chales E.Leiserson, Ronald L.Rivest, Clifford Stein, “Introduction to Algorithms”, McGraw Hill 2009, 3rd Edition	
2.	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education 2003	
Web Resources		
1.	https://www.programiz.com/dsa	
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	15

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

Multimedia Systems

Learning Objectives			
LO1	Understand the definition of Multimedia		
LO2	To study about the Image File Formats, Sounds Audio File Formats		
LO3	Understand the concepts of Animation and Digital Video Containers		
LO4	To study about the Stage of Multimedia Project		
LO5	Understand the concept of Ownership of Content Created for Project Acquiring Talent		
UNIT	Contents	No. of Hours	Course Objective
I	Multimedia Definition-Use Of Multimedia-Delivering Multimedia- Text: About Fonts and Faces - Using Text in Multimedia -Computers and Text Font Editing and Design Tools-Hypermedia and Hypertext.	6	
II	Images: Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound - DigitalAudio-MidiAudio-Midivs.DigitalAudio-MultimediaSystemSoundsAudio File Formats - Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project	6	
III	Animation: The Power of Motion-Principles of Animation-Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays-Digital Video Containers-Obtaining Video Clips -Shooting and Editing Video	6	
IV	Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-Multimedia Production Team.	6	
V	Planning and Costing: The Process of Making Multimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content andTalent:AcquiringContent-OwnershipofContentCreatedforProject-AcquiringTalent	6	
Total		30	
Course Outcomes			Programme Outcomes
CO	On completion of this course, students will		
CO1	understand the concepts, importance, application and the process of developing multimedia		PO1
CO2	to have basic knowledge and understanding about image related processing's		PO1, PO2
CO3	To understand the framework of frames and bit images to animations		PO4, PO6

CO4	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6
CO5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO6
Text Book		
1	Tay Vaughan, "Multimedia: Making It Work", 8th Edition, Osborne/McGraw - Hill, 2001.	
Reference Books		
1.	Ralf Steinmetz & Klara Nahrstedt "Multimedia Computing, Communication & Applications", Pearson Education, 2012.	
Web Resources		
1.	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	3	3	3	2
CO2	2	3	2	3	2	1
CO3	1	2	3	3	3	2
CO4	3	2	2	2	1	2
CO5	2	3	1	3	3	3
Weightage of course contributed to each PSO	10	12	11	14	12	10

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

Web Designing

Learning Objectives		
LO1	Understand the basics of HTML and its components	
LO2	To study about the Graphics in HTML	
LO3	Understand and apply the concepts of XML and DHTML	
LO4	Understand the concept of JavaScript	
LO5	To identify and understand the goals and objectives of the Ajax	
UNIT	Details	No. of Hours
I	HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment links-tables-frames.	6
II	Forms & Images Using Html: Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page.	6
III	XML & DHTML: Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML).	6
IV	Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding. JavaScript: Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition,	6
V	Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.	6
Total		30
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Develop working knowledge of HTML	PO1, PO3, PO6, PO8
CO2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1,PO2,PO3,PO6
CO3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5

CO4	Ability to develop a java script	PO1, PO2, PO3, PO7
CO5	An ability to develop web application using Ajax.	P02, PO6, PO7
Text Book		
1	Pankaj Sharma, “Web Technology”, SkKataria& Sons Bangalore 2011.	
2	Mike Mcgrath, “Java Script”, Dream Tech Press 2006, 1st Edition.	
3	Achyut S Godbole & AtulKahate, “Web Technologies”, 2002, 2nd Edition.	
Reference Books		
1.	Laura Lemay, Rafe Colburn, Jennifer Kyrmin, “Mastering HTML, CSS & Javascript Web Publishing”, 2016.	
2.	DT Editorial Services (Author), “HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)”, Paperback 2016, 2nd Edition.	
Web Resources		
1.	NPTEL & MOOC courses titled Web Design and Development.	
2.	https://www.geeksforgeeks.org	

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

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

Database Management System

Learning Objectives		
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.	
LO2	To understood the concepts of data base management system, design simple Database models	
LO3	To learn and understand to write queries using SQL, PL/SQL.	
LO4	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.	
LO5	To understood the concepts of data base management system, design simple Database models	
UNIT	Contents	No. of Hours
I	Database Concepts: Database Systems - Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction	15
II	Design Concepts: Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram	15
III	Normalization of Database Tables: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form. Introduction to SQL: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.	15

IV	Advanced SQL: Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS. SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join. Sub Queries and Correlated Queries: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function	15
V	PL/SQL: A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation – Arithmetic operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT...FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	15
Total		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	PO1
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)	PO4, PO6
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO5
Text Book		
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition	

2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016
Reference Books	
1.	Abraham Silbers chatz, Henry F.Korth and S.Sudarshan,“Database System Concepts”, McGraw Hill International Publication ,VI Edition
2.	Shio Kumar Singh , “Database Systems “,Pearson publications ,II Edition
Web Resources	
1.	Web resources from NDL Library, E-content from open-source libraries

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

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

Database Management System Lab

Learning Objectives			
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.		
LO2	To understood the concepts of data base management system, design simple Database models		
LO3	To learn and understand to write queries using SQL, PL/SQL.		
LO4	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.		
LO5	To understood the concepts of data base management system, design simple Database models		
	List of Exercises:	No. of Hours	Course Objective
II	I. SQL 1. DDLCOMMANDS 2. DMLCOMMANDS 3. TCLCOMMANDS II. PL/SQL 4. FIBONACCI SERIES 5. FACTORIAL 6. STRING REVERSE 7. SUM OF SERIES 8. TRIGGER III. CURSOR 9. STUDENT MARK ANALYSIS USING CURSOR IV. APPLICATION 10. LIBRARY MANAGERMENTSYSTEM 11. STUDENT MARK ANALYSIS		75
	Total		75
Course Outcomes		Programme Outcomes	
CO	On completion of this course, students will		
CO1	Understand the various basic concepts of Data Base	PO1	

	System. Difference between file system and DBMS and compare various data models.	
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)	PO4, PO6
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO4
Text Book		
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition	
2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016	
Reference Books		
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", McGraw Hill International Publication ,VI Edition	
2.	Shio Kumar Singh , "Database Systems ", Pearson publications ,II Edition	
Web Resources		
1.	Web resources from NDL Library, E-content from open-source libraries	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	3	3	2
CO2	3	3	1	2	2	2
CO3	2	2	3	3	3	3
CO4	2	2	3	3	3	1
CO5	2	3	3	3	3	3
Weightage of course contributed to each PSO	12	12	13	14	14	11

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

Advanced Excel

Learning Objectives

LO1	Handle large amounts of data	
LO2	Aggregate numeric data and summarize into categories and subcategories	
LO3	Filtering, sorting, and grouping data or subsets of data	
LO4	Create pivot tables to consolidate data from multiple files	
LO5	Presenting data in the form of charts and graphs	
UNIT	Contents	No. of 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- Nested VLOOKUP with Exact Match- VLOOKUP with Tables, Dynamic Ranges- Nested VLOOKUP with Exact Match- Using VLOOKUP to consolidate Data from Multiple Sheets	6
II	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- multiple-level sorting- custom sorting- Filtering data for selected view - advanced filter options- Working with Reports Creating subtotals- Multiple-level subtotal.	6
III	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, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers.	6

IV	More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- What If Analysis - Goal Seek- Data Tables- Scenario Manager.	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 Sparkline's, Inline Charts, data Charts- Overview of all the new features.	6
Total		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn No-SQL databases and management.	PO3, PO8
Text Book		
1	Excel 2019 All	
2	Microsoft Excel 2019 Pivot Table Data Crunching	
Reference Books		
1	Excel 2019 All-in-One for Dummies, Greg Harvey, 1st edition	
Web Resources		
1.	https://www.simplilearn.com	
2	https://www.javatpoint.com	
3	https://www.w3schools.com	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	3	2	3	3	3
CO4	3	2	2	3	3	3
CO5	3	2	2	3	3	3
Weightage of course contributed to each PSO	15	12	10	15	15	15

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

PHP Programming

LO1	To provide the necessary knowledge on basics of PHP.	
LO2	To design and develop dynamic, database-driven web applications using PHP version.	
LO3	To get an experience on various web application development techniques.	
LO4	To learn the necessary concepts for working with the files using PHP.	
LO5	To get a knowledge on OOPS with PHP.	
UNIT	Contents	No. of Hours
I	Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation	6
II	PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML -Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.	6
III	Switch () Statements -Using the while () Loop -Using the for() Loop PHP Functions -Creating an Array -Modifying Array Elements - Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions.	6
IV	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.	6
V	Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies.	6
	Total	30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6
CO2	Write regular expressions including modifiers, operators, and meta characters.	PO2, PO5,PO7.
CO3	Create PHP Program using the concept of array.	PO3, PO4, PO5.
CO4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5
CO5	Manipulate files and directories.	PO3, PO5,PO6.
Text Book		
1	Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.	
2	The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes	
Reference Books		
1.	PHP: The Complete Reference-Steven Holzner.	
2.	DT Editorial Services (Author), “HTML 5 Black Book (Covers CSS3, JavaScript, XML,	

	<i>XHTML, AJAX, PHP, jQuery)</i> ”, Paperback 2016, 2 nd Edition.
Web Resources	
1.	Open source digital libraries: PHP Programming
2.	https://www.w3schools.com/php/default.asp

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

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

Java Programming

LO1	To provide fundamental knowledge of object-oriented programming	
LO2	To equip the student with programming knowledge in Core Java from the basics up.	
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.	
LO4	To provide fundamental knowledge of object-oriented programming.	
LO5	To equip the student with programming knowledge in Core Java from the basics up.	
UNIT	Contents	No. of Hours
I	Introduction: Review of Object Oriented concepts – History of Java – Java buzz words – JVM architecture - Datatypes - Variables - Scope and life time of variables - arrays - operators – control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data – Static Method String and String Buffer Classes.	15
II	Inheritance: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. Packages: Definition-Access Protection -Importing Packages. Interfaces: Definition–Implementation–Extending Interfaces. Exception Handling: <i>try – catch- throw - throws – finally</i> – Built-in exceptions - Creating own Exception classes.	15
III	Multithreaded Programming: Thread Class - Runnable interface –Synchronization–Using synchronized methods– Using synchronized statement- Inter thread Communication –Deadlock. I/O Streams: Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	15
IV	AWT Controls: The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout	15

	managers. Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes	
V	Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers – J Frame – J Window – J Dialog – J Panel – J Button – J toggle Button – J Check Box – J Radio Button – J Label, J Text Field – J Text Area – J List – J Combo Box – J Scroll Pane.	15
	Total	75

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1, PO2, PO6
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO2, PO3, PO8
CO3	Implement multi-threading and I/O Streams of Core Java	PO1, PO3, PO5
CO4	Implement AWT and Event handling.	PO2, PO6
CO5	Use Swing to create GUI.	PO1, PO3, PO6

Text Books:

1.	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010
2.	Gary Cornell, <i>Core Java 2 Volume I – Fundamentals</i> , Addison Wesley, 1999

References :

1.	Head First Java, O’Rielly Publications,
2.	Y. Daniel Liang, <i>Introduction to Java Programming</i> , 7th Edition, Pearson Education India, 2010

Web Resources

1.	https://javabeginnerstutorial.com/core-java-tutorial
2.	http://docs.oracle.com/javase/tutorial/
3.	https://www.coursera.org/

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3

CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	1
Weightage of course contributed to each PSO	14	14	13	14	14	11

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

Java Programming Lab

Learning Objectives	
LO1	To provide fundamental knowledge of object-oriented programming.
LO2	To equip the student with programming knowledge in Core Java from the basics up.
LO3	To enable the students to know about Event Handling.
LO4	To enable the students to use String Concepts.
LO5	To equip the student with programming knowledge in to create GUI using AWT controls.
EXCERCISE	Details
1	Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer
2	Write a Java program to multiply two given matrices.
3	Write a Java program that displays the number of characters, lines and words in a text
4	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.
5	Write a program to do String Manipulation using Character Array and perform the following string operations: a. String length b. Finding a character at a particular position c. Concatenating two strings
6	Write a program to perform the following string operations using String class: a. String Concatenation b. Search a substring c. To extract substring from given string
7	Write a program to perform string operations using String Buffer class: a. Length of a string b. Reverse a string

	c. Delete a substring from the given string	
8	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	
9	Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.	60
10	Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception c. Array Index Out of Bound Exception d. Negative Array Size Exception	
11	Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes	
12	Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.	
13	Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).	
14	Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.	
15	Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color.	

	Initially there is no message shown.	
	Total	60
	Course Outcomes	Programme Outcome
CO	On completion of this course, students will	
1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1
2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO1, PO2
3	Implement multi-threading and I/O Streams of Core Java	PO4, PO6
4	Implement AWT and Event handling.	PO4, PO5, PO6
5	Use Swing to create GUI.	PO3, PO6
	Text Book	
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.	
2.	Gary Cornell, <i>Core Java 2 Volume I – Fundamentals</i> , Addison Wesley, 1999.	
	Reference Books	
1.	Head First Java, O’Rielly Publications,	
2.	Y. Daniel Liang, <i>Introduction to Java Programming</i> , 7th Edition, Pearson Education India, 2010.	
	Web Resources	
1.	https://www.w3schools.com/java/	
2.	http://java.sun.com	
3.	http://www.afu.com/javafaq.html	

Mapping with Programme Outcomes:
S-Strong M-Medium L-Low

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	14	14	13	14	14	12

Application Development for Smart Environment

CO No.	Course Outcomes	K - Level	Unit
CO1	To comprehend the key concepts of S-L and differentiate the community service and Service-Learning	K2	1
CO2	Discuss the software development process	K2	2
CO3	Demonstrate the process of application development	K3	3
CO4	Apply the thematic concepts to address the community issues	K3	4
CO5	Analyze the effectiveness of the application in addressing the communal needs	K4	5

2 a Syllabus

<p>Unit 1</p> <p>Service-Learning – Definition, difference between community service and service-learning, Principles; Whole Person Education. Identifying Community Needs, Community Partners, Reflection, and Reciprocity. Public Dissemination; Understanding of community dynamics. Project Planning Stages and report preparation</p> <p>Classroom Activity:</p> <ol style="list-style-type: none"> i. Group discussion about Civic/Social responsibility (Display of Video/Documentary film (Through this activity Students should recognize civic responsibility of the society) ii. Conduct a role play/games/drawing to provide problem solving skill and ignites critical thinking. iii. Group activity to frame questionnaire for identify community needs iv. Reflection on identify the need of the community (Students go to the community for identify the community needs and reflect their experience)
<p>Unit 2 - Software Engineering</p> <p>Software Engineering Process Models – Architectural Design – Software Quality Management – Testing Strategies- Maintenance and Reengineering</p> <p>Classroom Activity:</p> <ol style="list-style-type: none"> i Questionnaire Preparation ii Poster Presentation iii Live Polling iv Video Creation v Group Discussion
<p>Unit 3 Application Development</p> <p>Database Management System – Query Execution – Working with tables – Database Connectivity – Application development tools and techniques</p> <p>Classroom Activity:</p> <ol style="list-style-type: none"> i Data Base Creation ii Online Tools Demo iii Simple Projects Demo iv Exhibition
<p>Unit 4 Community Engagement Process:</p> <p>Identifying Communal issues related to Thematic challenges, Exploring and</p>

Popularizing Data - Analyzing and relating the problems to computational methods and models -Framing tools and techniques - interrelate the societal problems into computational solution framework.

Field Activity:

- i. Survey Questionnaire
- ii Questionnaire Analysis
- iii Problem Identification
- iv journal of the Framework Design

Unit 5 Software Project Proposal Development

Choosing the tools and techniques - cleaning the data - Identifying the process models - software requirement analysis - software design development - logical design - risk identification and mitigation - rewiring the field study

Field Activity

- i Working On Tools
- ii Implementation Of Project
- iii Testing And Deployment
- iv Journal

b. Text Books

- 1. "Software Engineering: A Practitioner's Approach" by Roger S. Pressman
- 2. "Database Systems: The Complete Book" by Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Wisdom

c. References

- 1. "Software Engineering: Modern Approaches" by Eric J. Braude and Michael E. Bernstein
- 2. "Database Management Systems" by Raghu Ramakrishnan and Johannes Gehrke
- 3. "Requirements Engineering: From System Goals to UML Models to Software Specifications" by Axel van Lams weerde
- 4. "Design Patterns: Elements of Reusable Object-Oriented Software" by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides
- 5. "Software Testing: Concepts and Practices" by Srinivasan Desikan and Gopalaswamy Ramesh
- 6. "Managing Risk in Information Systems" by Darril Gibson

3. Specific Learning Outcomes

Unit & Section	Course Content	Learning Outcomes	Highest Level of Bloom Taxonomic Transaction
1	Service-Learning – Definition, difference between community service and service - learning	Understanding the difference between S-L and other community services	K2
	Principles – Whole Person Education.	Comprehend the Whole Person education	K2
	Identifying Community Needs, Community Partners	Linking discipline specific knowledge and community needs Collaboration with community partners	K2
	Reflection, Reciprocity	Reflection about field exposure and	K2

		highlighting the benefits of the recipients and provider through service-learning	
	Public Dissemination; Understanding of community dynamics	Recognize and celebrate the contribution of students and community	K2
	Project Planning Stages and report preparation	Apply the S-L principles, analyze the community intervention, assess the community benefits present the reflection.	K2
2	Software Engineering Process Models	<ul style="list-style-type: none"> - Define various software engineering process models, such as Waterfall, Agile, and Spiral. - Identify the key characteristics and phases of each software engineering process model. - Recall the advantages and disadvantages of different software engineering process models. - Recognize the appropriate use of software engineering process models based on project requirements. 	K2
	Architectural Design	<ul style="list-style-type: none"> - Describe the concept of architectural design in software engineering. - Recognize different architectural styles, such as client-server, layered, and micro services. - Explain the principles and patterns used in architectural design, such as separation of concerns and model-view-controller (MVC). - Identify the factors influencing architectural design decisions, such as performance, scalability, and security. 	K2
	Software Quality Management	<ul style="list-style-type: none"> - Define software quality management and its importance in software development. - Recognize different quality attributes, such as reliability, maintainability, and usability. - Explain the activities involved in software quality management, including quality planning, assurance, and control. - Recall the techniques and tools used for software quality management, such as inspections, testing, and metrics. 	K2
	Testing Strategies	<ul style="list-style-type: none"> - Define software testing and its role in ensuring software quality. - Identify different types of testing, such as unit testing, integration testing, and acceptance testing. - Explain the objectives and techniques used in each testing phase, such as black-box testing and white-box testing. - Recognize the importance of test planning, test execution, and test reporting in a comprehensive testing strategy. 	K2
	Maintenance and Reengineering	<ul style="list-style-type: none"> - Describe the concepts of software maintenance and reengineering. - Explain the different types of software maintenance, such as corrective, adaptive, and perfective maintenance. - Recognize the challenges and benefits of 	K2

		software maintenance and reengineering. - Identify the techniques and tools used in software maintenance and reengineering, such as code refactoring and reverse engineering.	
3	Database Management System	- Interpret the purpose and functions of a database management system (DBMS) in software development. - Explain the key components of a DBMS, such as data models, schemas, and query languages. - Compare and contrast different types of DBMS, such as relational, object-oriented, and NoSQL databases. - Summarize the advantages and limitations of using a DBMS for data storage and management.	K3
	Query Execution	- Analyze and interpret the process of executing database queries. - Describe the different components involved in query execution, such as query parsing, optimization, and evaluation. - Evaluate the performance implications of various query execution strategies and techniques. - Determine the most appropriate query execution approach based on specific requirements and constraints.	K3
	Working with tables Working with tables	- Differentiate between the concepts of tables, rows, and columns in a relational database. - Demonstrate the ability to create, modify, and delete tables in a database. - Interpret the structure and constraints of database tables, including primary keys, foreign keys, and data types. - Apply table manipulation operations, such as inserting, updating, and deleting records.	K3
	Database Connectivity	- Explain the concept of database connectivity and its role in software applications. - Identify and utilize appropriate APIs and libraries for connecting to databases. - Demonstrate the ability to establish and manage connections to a database from an application. - Evaluate different database connectivity options and select the most suitable one for a given scenario.	K3
	Application development tools and techniques	- Describe various tools and techniques used in application development with databases. - Explain the role of integrated development environments (IDEs) and database management tools in software development. - Utilize programming languages and frameworks to interact with databases. - Evaluate the impact of different development approaches.	K3

4	Identifying Communal issues related to Thematic challenges, Exploring and Popularizing Data	<ul style="list-style-type: none"> - Analyze and identify communal issues prevalent in society related to specific thematic challenges, such as healthcare, education, or environmental sustainability. - Describe the social, economic, or cultural factors contributing to communal issues within the context of thematic challenges. - Evaluate the impact of communal issues on individuals, communities, and society as a whole. - Differentiate between various communal issues and their specific manifestations in different thematic areas. - Interpret and analyze data related to communal issues and thematic challenges using appropriate data exploration techniques. - Describe the significance of data in understanding and addressing communal issues within thematic challenges. - Summarize data findings and insights to effectively communicate and popularize information related to communal issues. - Evaluate the quality and reliability of data sources used in exploring communal issues and thematic challenges. 	K3
	Analyzing and relating the problems to computational methods and models	<ul style="list-style-type: none"> - Analyze communal issues within thematic challenges and identify how computational methods and models can be applied to understand or solve these problems. - Relate communal issues to relevant computational techniques, such as machine learning, data mining, or simulation models. - Assess the strengths and limitations of computational methods and models in addressing communal issues within thematic challenges. - Formulate hypotheses or research questions that can be addressed using computational methods and models to better understand communal issues. 	K3
	Framing tools and techniques	<ul style="list-style-type: none"> - Explain the tools and techniques used in computational problem-solving related to communal issues and thematic challenges. - Apply appropriate computational tools and techniques to frame and structure communal issues within a problem-solving framework. - Evaluate the suitability and effectiveness of different computational tools and techniques for addressing specific communal issues. - Demonstrate the ability to use computational tools and techniques to analyze and visualize data related to communal issues and thematic challenges. 	K3
	Interrelate the societal problems into	<ul style="list-style-type: none"> - Demonstrate the ability to interrelate societal problems, specifically communal issues, into a 	K3

	computational solution framework.	<p>computational solution framework.</p> <ul style="list-style-type: none"> - Evaluate the ethical and societal implications of employing computational solutions for communal issues. - Assess the scalability and sustainability of computational solutions in addressing communal issues within the context of thematic challenges. - Propose strategies for integrating computational solutions with other interdisciplinary approaches to address communal issues effectively. 	
5	Choosing the tools and techniques	<ul style="list-style-type: none"> - Evaluate and select appropriate tools and techniques based on specific project requirements and constraints. - Assess the strengths, limitations, and trade-offs of different tools and techniques for a given context. - Justify the selection of tools and techniques based on their relevance and effectiveness in achieving project goals. - Compare and contrast various tools and techniques to determine the most suitable ones for a particular software development task. 	K4
	Cleaning the data	<ul style="list-style-type: none"> - Analyze and identify data quality issues and inconsistencies within a dataset. - Develop strategies and methods to clean and preprocess data to improve its quality and reliability. - Implement data cleaning techniques, such as removing duplicates, handling missing values, and standardizing formats. - Evaluate the effectiveness of data cleaning processes and techniques in ensuring data accuracy and consistency. 	K4
	Identifying the process models	<ul style="list-style-type: none"> - Evaluate different software process models, such as Waterfall and Agile in terms of their suitability for specific project requirements. - Analyze project characteristics and constraints to determine the most appropriate process model. - Justify the selection of a specific process model based on its advantages and alignment with project goals. - Compare and contrast different process models, identifying their strengths, weaknesses, and potential risks. 	K4
	Software requirement analysis	<ul style="list-style-type: none"> - Analyze and decompose complex software requirements into manageable and testable components. - Identify functional and non-functional requirements, and prioritize them based on their importance and impact. - Evaluate and apply techniques, such as use case analysis, user story mapping, or 	K4

		<p>requirements elicitation, to gather and document software requirements.</p> <ul style="list-style-type: none"> - Validate and verify software requirements to ensure they are complete, consistent, and aligned with stakeholders' needs. 	
Software design development: Logical design		<ul style="list-style-type: none"> - Analyze software requirements and translate them into a logical design, including system architecture, data models, and interaction diagrams. - Evaluate design principles and patterns to ensure modularity, reusability, and maintainability of software components. - Develop design artifacts, such as class diagrams, entity-relationship diagrams, and sequence diagrams, to represent the logical design. - Validate and refine the logical design through reviews and feedback, ensuring it aligns with software requirements and quality goals. 	K4
Risk identification and mitigation		<ul style="list-style-type: none"> - Identify potential risks and uncertainties that may impact software development projects. - Analyze and assess risks based on their likelihood, impact, and severity. - Develop risk mitigation strategies and contingency plans to minimize the impact of identified risks. - Monitor and manage risks throughout the software development lifecycle, implementing appropriate risk mitigation actions. 	K4
Rewiring the field study		<ul style="list-style-type: none"> - Analyze and evaluate the findings and outcomes of a field study conducted within a specific context. - Identify areas for improvement or modification based on the field study results. - Develop strategies and plans for implementing changes or improvements based on the field study findings. - Assess the impact and effectiveness of the field study rewiring process in addressing identified issues or enhancing the overall project outcomes. 	K4

Software Engineering

Learning Objectives			
LO1	Gain basic knowledge of analysis and design of systems		
LO2	Ability to apply software engineering principles and techniques		
LO3	Model a reliable and cost-effective software system		
LO4	Ability to design an effective model of the system		
LO5	Perform Testing at various levels and produce an efficient system.		
UNIT	Contents	No. of Hours	Course Objectives
I	<p>Introduction: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering.</p> <p>Software Life Cycle Models: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.</p>	15	
II	<p>Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS)</p> <p>Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design</p>	15	
III	<p>Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. User-Interface design: Characteristics of a good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.</p>	15	
IV	<p>Coding and Testing: Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues</p>	15	

	associated with testing. Software Reliability and Quality Management: Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.	
v	Computer Aided Software Engineering: CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. Software Maintenance: Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost.	15
	Total	75
Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Gain basic knowledge of analysis and design of systems	PO1
CO2	Ability to apply software engineering principles and techniques	PO1, PO2
CO3	Model a reliable and cost-effective software system	PO4, PO6
CO4	Ability to design an effective model of the system	PO4, PO5, PO6
CO5	Perform Testing at various levels and produce an efficient system.	PO3, PO6
Text Books		
1.	Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018	
References Books		
1.	Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997	
2.	Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.	
3.	James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	2	2	3
CO2	3	2	2	2	1	2
CO3	3	3	3	2	3	2
CO4	3	3	3	2	2	2
CO5	3	3	3	2	2	2
Weightage of course contribute d to each PO/PSO	15	13	14	10	10	11

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

.NET Programming

Course Objective		
C1	To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language.	
C2	To develop ASP.NET Web application using standard controls.	
C3	To implement file handling operations.	
C4	To handles SQL Server Database using ADO.NET.	
C5	Understand the Grid view control and XML classes.	
UNIT	Contents	No. of Hours
I	Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements - Looping statements – Creating and using Objects – Arrays – String operations.	18
II	Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls -List Controls: Properties and its events.	18
III	Rich Controls: Properties and its events – validation controls: Properties and its events– File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deleting files – File uploading.	18
IV	ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controls and its Properties – Data Binding	18
V	Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating a Web application.	18
Total		90
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Develop working knowledge of C# programming constructs and the .NET Framework	PO1, PO2, PO6
2	To develop a software to solve real-world problems using ASP.NET	PO2, PO3, PO5
3	To Work On Various Controls Files	PO1, PO3, PO6
4	To create a web application using MicrosoftADO.NET.	PO2, PO6

5	To develop web applications using XML	PO1, PO3, PO6
Text Book		
1	Svetlin Nakov, Veselin Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.	
2	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill, 2015.	
Reference Books		
1.	Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill, 2017.	
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtechpres, 2013.	
3.	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach & Associates Inc.2016.	
4.	DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGrawHill, 2008.	
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS, 2010.	
Web Resources		
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/	
2.	https://www.javatpoint.com/net-framework	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	2	3
CO2	3	2	2	3	3	3
CO3	3	3	3	2	3	3
CO4	2	2	1	3	3	2
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	14	13	12	14	14	14

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

.NET Programming Lab

Course Objective		
LO1	To develop ASP.NET Web application using standard controls.	
LO2	To create rich database applications using ADO.NET.	
LO3	To implement file handling operations.	
LO4	To implement XML classes.	
LO5	To utilize ASP.NET security features for authenticating the website	
Sl. No	Programs	No. of Hours
1.	Create an exposure of Web applications and tools	75
2.	Implement the Html Controls	
3.	Implement the Server Controls	
4.	Web application using Web controls.	
5.	Web application using List controls.	
6.	Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts.	
7.	Web application using Data Controls.	
8.	Data binding with Web controls	
9.	Data binding with Data Controls.	
10.	Database application to perform insert, update and delete operations.	
11.	Database application using Data Controls to perform insert, delete, edit, paging and sorting operation.	
12.	Implement the Xml classes.	
13.	Implement Authentication – Authorization.	
14.	Ticket reservation using ASP.NET controls.	
15.	Online examination using ASP.NET controls	
Total		75
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	To create web applications and implement various controls	PO1, PO2, PO4
CO2	Create web pages in Rich control.	PO3, PO5
CO3	Develop knowledge about file handling operations	PO1, PO4, PO5
CO4	An ability to design XML classes	PO2, PO4,

		PO6
CO5	To develop a software to solve real-world problems using ASP.NET	PO1,PO3, PO5, PO6
Text Book		
1	Svetlin Nakov, Veselin Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.	
2	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill, 2015.	
Reference Books		
1.	Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill, 2017.	
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres, 2013.	
3.	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach & Associates Inc.2016.	
4.	Denielle Otey, Michael Otey, ADO.NET: The Complete reference, McGrawHill, 2008.	
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS, 2010.	
Web Resources		
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/	
2.	https://www.javatpoint.com/net-framework	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

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

Introduction to Data Science

Learning Objectives		
LO1	To learn about basics of Data Science and Big data.	
LO2	To learn about overview and building process of Data Science.	
LO3	To learn about various Algorithms in Data Science.	
LO4	To learn about Hadoop Framework.	
LO5	To learn about case study about Data Science.	
UNIT	Contents	No. of Hours
I	Introduction: Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science	12
II	The Data science process: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building.	12
III	Algorithms : Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised	12
IV	Introduction to Hadoop : Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types	12
V	Case Study: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation	12
Total		60
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the basics in Data Science and Big data.	PO1
CO2	Understand overview and building process in Data Science.	PO1, PO2
CO3	Understand various Algorithms in Data Science.	PO3, PO6
CO4	Understand Hadoop Framework in Data Science.	PO4, PO5
CO5	Case study in Data Science.	PO3, PO5
Text Book		
1	Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “Introducing Data Science”, manning publications 2016	
Reference Books		
1.	Roger Peng, “The Art of Data Science”, lulu.com 2016.	
2.	MurtazaHaider, “Getting Started with Data Science – Making Sense of Data with Analytics”, IBM press, E-book.	

3.	Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools", Dreamtech Press 2016.
4.	Annalyn Ng, Kenneth Soo, "Numsense! Data Science for the Layman: No Math Added", 2017, 1st Edition.
5.	Cathy O'Neil, Rachel Schutt, "Doing Data Science Straight Talk from the Frontline", O'Reilly Media 2013.
6.	Lillian Pierson, "Data Science for Dummies", 2017 II Edition
Web Resources	
1.	https://www.w3schools.com/datascience/
2.	https://en.wikipedia.org/wiki/Data_science
3.	http://www.cmap.polytechnique.fr/~lepenec/en/post/references/refs/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	14	11	15	11	10

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

Cloud Computing

Course Objective		
LO1	Learning fundamental concepts and Technologies of Cloud Computing.	
LO2	Learning various cloud service types and their uses and pitfalls.	
LO3	To learn about Cloud Architecture and Application design.	
LO4	To know the various aspects of application design, benchmarking and security on the Cloud.	
LO5	To learn the various Case Studies in Cloud Computing.	
UNIT	Contents	No. of Hours
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.	12
II	Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services Content Delivery Services: Amazon Cloud Front - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google Big Query - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack -	12

	Amazon Cloud Formation Identity and Access Management Services: Amazon Identify and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: Cloud Stack – Eucalyptus - OpenStack	
III	Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Up gradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), REST ful Web Services – Data Storage Approches: Relational Approach (SQL), Non-Relational Approach (NoSQL).	12
IV	Cloud Application Bench marking and Tuning: Introduction to Bench marking – Steps in Bench marking – Workload Characteristics – Application Performance Metrics – Design Consideration for Bench marking Methodology – Bench marking Tools and Types of Tests – Deployment Proto typing. Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data atrest, securing data in motion – Key Management – Auditing.	12
V	Case Studies: Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	12
	Total	60
	Course Outcomes	Programme Outcome
CO	On completion of this course, students will	
CO 1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1
CO 2	Able to understand various cloud service types and their uses and pitfalls.	PO1, PO2
CO 3	Able to understand Cloud Architecture and	PO4, PO5

	Application design.	
CO 4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
CO 5	Understand various Case Studies in Cloud Computing.	PO3, PO6
Text Book		
1	ArshdeepBahga, Vijay Madiseti, <i>Cloud Computing – A Hands On Approach</i> , Universities Press (India) Pvt. Ltd., 2018	
Reference Books		
1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter, <i>Cloud Computing: A Practical Approach</i> , Tata McGraw-Hill, 2013.	
2.	Barrie Sosinsky, <i>Cloud Computing Bible</i> , Wiley India Pvt. Ltd., 2013.	
3.	David Crookes, <i>Cloud Computing in Easy Steps</i> , Tata McGraw Hill, 2015.	
4.	Dr. Kumar Saurabh, <i>Cloud Computing</i> , Wiley India, Second Edition 2012.	
Web Resources		
1.	https://en.wikipedia.org/wiki/Cloud_computing	
2.	https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7	
3.	https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	14	11	15	15	10

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

Computer Networks

Course Objective		
LO1	To learn the basic concepts of Data communication and Computer network	
LO2	To learn about wireless Transmission	
LO3	To learn about networking and data link layer.	
LO4	To study about Network communication.	
LO5	To learn the concept of Transport layer	
UNIT	Contents	No. of Hours
I	Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media	15
II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.	15
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth.	15
IV	Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.	15
V	Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography	15
	Total	75
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models	PO1
CO2	To gain knowledge on Telephone systems using wireless network	PO1, PO2
CO3	To understand the concept of MAC	PO4, PO6
CO4	To analyze the characteristics of Routing and Congestion control algorithms	PO4, PO5, PO6
CO5	To understand network security and define various	PO3, PO4

	protocols such as FTP, HTTP, Telnet, DNS	
Text Book		
1	A. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008.	
Reference Books		
1.	B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition, 2017	
2.	F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education, 2008	
3.	D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, PHI, 2008.	
4.	Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002	
Web Resources		
1.	https://en.wikipedia.org/wiki/Computer_network	
2.	https://citationsy.com/styles/computer-networks	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	2	3
CO2	3	2	2	2	2	2
CO3	3	2	3	3	2	3
CO4	3	2	2	2	2	2
CO5	3	2	2	2	2	3
Weightage of course contributed to each PSO	15	11	11	12	10	13

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

Machine Learning

Learning Objectives

LO1	To Learn about Machine Intelligence and Machine Learning applications
LO2	To implement and apply machine learning algorithms to real-world applications
LO3	To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems
LO4	To create instant based learning
LO5	To apply advanced learning

UNIT	Contents	No. Of. Hours
I	Introduction Machine Learning - Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbour, support vector machines	15
II	Neural networks and genetic algorithms Neural Network Representation – Problems – Perceptron’s – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.	15
III	Bayesian and computational learning Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	15
IV	Instant based learning K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.	15
V	Advanced learning Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.	15

TOTAL HOURS **75**

Course Outcomes

Programme Outcomes

CO	On completion of this course, students will	Programme Outcomes
CO1	Appreciate the importance of visualization in the data analytics solution	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply structured thinking to unstructured problems	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand a very broad collection of machine learning algorithms and problems	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theor	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop an appreciation for what is involved in learning from data.	PO1, PO2, PO3, PO4, PO5, PO6

1	Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2	Bengio, Yoshua, Ian J. Good fellow, and Aaron Courville. "Deep learning" 2015, MIT Press
Reference Books	
1.	EthemAlpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2	Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	15	15	14	15	14	14

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

Machine Learning Lab

Learning Objectives: To apply the concepts of Machine Learning to solve real-world problems and to implement basic algorithms in clustering & classification applied to text & numeric data	
LAB EXERCISES	Required Hour
<ol style="list-style-type: none"> 1. Solving Regression & Classification using Decision Trees 2. Root Node Attribute Selection for Decision Trees using Information Gain 3. Bayesian Inference in Gene Expression Analysis 4. Pattern Recognition Application using Bayesian Inference 5. Bagging in Classification 6. Bagging, Boosting applications using Regression Trees 7. Data & Text Classification using Neural Networks 8. Using Weka tool for SVM classification for chosen domain application 9. Data & Text Clustering using K-means algorithm 10. Data & Text Clustering using Gaussian Mixture Models 	60

Course Outcomes	
CO	On completion of this course, students will
CO1	Effectively use the various machine learning tools
CO2	Understand and implement the procedures for machine learning algorithms
CO3	Design Python programs for various machine learning algorithms
CO4	Apply appropriate datasets to the Machine Learning algorithms
CO5	Analyze the graphical outcomes of learning algorithms with specific datasets

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	3	3	3
CO 4	2	3	3	3	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	14	15	15	14	15	14

Big Data Analytics

Course Objective			
C1	Understand the Big Data Platform and its Use cases, Map Reduce Jobs		
C2	To identify and understand the basics of cluster and decision tree		
C3	To study about the Association Rules, Recommendation System		
C4	To learn about the concept of stream		
C5	Understand the concepts of NoSQL Databases		
UNIT	Contents	No. of Hours	Course Objective
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — Map Reduce and YARN — Map Reduce Programming Model	12	
II	Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions. - Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes Theorem — Naïve Bayes Classifier.	12	
III	Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.	12	

IV	Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics	12
V	NoSQL Databases : Schema-less Models : Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.	12
Total		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO5
4	Perform analytics on data streams.	PO3, PO5, PO6
5	Learn NoSQL databases and management.	PO3, PO4
Text Book		
1	Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.	
Reference Books		
1.	David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/El Sevier Publishers, 2013	
2.	EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.	
Web Resources		
1.	https://www.simplilearn.com	
2.	https://www.sas.com/en_us/insights/analytics/big-data-analytics.html	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	3
CO2	3	3	2	3	3	3
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2

Cryptography

LO1	To understand the fundamentals of Cryptography	
LO2	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.	
LO3	To understand the various key distribution and management schemes.	
LO4	To understand how to deploy encryption techniques to secure data in transit across data networks	
LO5	To design security applications in the field of Information technology	
UNIT	Contents	No. Of. Hours
I	Introduction: The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.	12
II	Classical Encryption Techniques: Symmetric cipher model – Substitution Techniques: Caesar Cipher – Mono alphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography	12
III	Block Cipher and DES: Block Cipher Principles – DES – The Strength of DES – RSA: The RSA algorithm.	12
IV	Network Security Practices: IP Security overview - IP Security architecture – Authentication Header. Web Security: Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction.	12
V	Intruders – Malicious software – Firewalls.	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply the different cryptographic operations of public key cryptography	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Apply the various Authentication schemes to simulate different applications.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand various Security practices and System security standards	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	William Stallings , “Cryptography and Network Security Principles and Practices”.	
Reference Books		
1.	Behrouz A. Foruzan , “Cryptography and Network Security”, Tata McGraw-Hill, 2007.	
2	AtulKahate , “ <i>Cryptography and Network Security</i> ”, Second Edition, 2003, TMH.	
3	M.V. Arun Kumar , “ <i>Network Security</i> ”, 2011, First Edition, USP.	

Web Resources	
1	https://www.tutorialspoint.com/cryptography/
2	https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	2
CO 2	3	2	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	2	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	14	13	15	12	14	14

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

Technical Communication for Computer Scientists

Course Objective

This course trains students soft skills required to take up jobs.

Learning Outcomes

Upon completion of this course students should be able to

- LO1. Demonstrate their activity to manage conversations, and take part in discussion
- LO2. Take notes, and effectively prepare documents

1. **Oral communication:** Starting and ending a conversation, telling and asking people to do things- expressing opinions and ideas- decisions and intentions- offers and invitations- feelings- right and wrong- numbers and money.
2. Purpose and audience- dealing with customers and clients- face to face discussions- meetings and attending meetings- checking understanding- raising questions- giving and receiving feedback- using body language- leading and directing discussions- concluding discussions, using graphics in oral presentation.
3. Reading comprehension and reference skills: Skimming and scanning, factual and inferential comprehension- prediction- guessing meaning of words from context- word reference- comprehending graphics in technical writing.
4. Reading strategies- reading speed, reading between lines for hidden meaning- interpreting graphics- using a dictionary- using an index- using a contents list to find information- choosing the right reference source.
5. Written Communication: Note making and note taking- summarizing- notes and memos- developing notes into text- organization of ideas- cohesion and coherence- paragraph writing- ordering information in space and time- short essays- description and argument- comparison and contrast- illustration- using graphics in writing- tables and charts- diagram and flow charts- maps, plans and graphs.
6. Spelling rules and tips- writing a rough draft- editing and proof reading- writing the final draft- styling text- filing in complex forms- standard letters- CV- writing a report- writing leaflets and brochures- writing references- essay writing- expository writing- description of processes and products- classification- the instructional process- arguments and presentation of arguments- narrating events chronologically.