

ST. XAVIER'S COLLEGE (AUTONOMOUS)

Palayamkottai - 627 002

**Recognized as "College with Potential for Excellence" by UGC
Accredited at A⁺⁺ Grade with a CGPA of 3.66 out of 4 in IV cycle by
NAAC**



SYLLABUS

M.Sc. COMPUTER SCIENCE

(W.e.f. June 2023)

TANSICHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION	
Programme	M.Sc., Computer Science
Programme Code	PCS
Duration	PG - Two Years
Programme Outcomes (POs)	<p>PO1: Problem Solving Skill Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.</p> <p>PO2: Decision Making Skill Foster analytical and critical thinking abilities for data-based decision-making.</p> <p>PO3: Ethical Value Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.</p> <p>PO4: Communication Skill Ability to develop communication, managerial and interpersonal skills.</p> <p>PO5: Individual and Team Leadership Skill Capability to lead themselves and the team to achieve organizational goals.</p> <p>PO6: Employability Skill Inculcate contemporary business practices to enhance employability skills in the competitive environment.</p> <p>PO7: Entrepreneurial Skill Equip with skills and competencies to become an entrepreneur.</p> <p>PO8: Contribution to Society Succeed in career endeavors and contribute significantly to society.</p> <p>PO9 Multicultural competence Possess knowledge of the values and beliefs of multiple cultures and a global perspective.</p> <p>PO10: Moral and ethical awareness/reasoning Ability to embrace moral/ethical values in conducting one's life.</p>
Programme Specific Outcomes (PSOs)	<p>PSO1 – Placement To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO2 - Entrepreneur To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.</p> <p>PSO3 – Research and Development Design and implement HR systems and practices grounded in research</p>

that comply with employment laws, leading the organization towards growth and development.

PSO4 – Contribution to Business World

To produce employable, ethical and innovative professionals to sustain in the dynamic business world.

PSO5 – Contribution to the Society

To contribute to the development of the society by collaborating with stakeholders for mutual benefit.

PG Science Programme Pattern
(With Effect from June 2023)

Sem	Part	Status	Sub. Code	Title of the Paper	Hrs	Cdt
I	A	Core-1	23PCSC11	Analysis and Design of Algorithms	5	4
		Core-2	23PCSC12	Object Oriented Analysis and Design	5	3
		Core-3	23PCSC13	Python Programming	5	4
		Core-4	23PCSC14	Python Programming-Lab	5	3
	B	EC-1	23PCSE11	Elective I (*Refer Elective List I)	5	3
		EC-2	23PCSE12	Elective II (*Refer Elective List II)	5	3
					30	20
II	A	Core-5	23PCSC21	Data Mining and Warehousing	6	5
		Core-6	23PCSC22	Advanced Operating System	6	4
		Core-7	23PCSC23	Advanced Java Programming	6	5
	B	EC-3	23PCSE21	Elective III (*Refer Elective List III)	4	3
		EC-4	23PCSE22	Elective IV(*Refer Elective List IV)	4	3
		SEC1	23PCSS21	Data Mining using R -Lab	4	2
					30	22
III	A	Core-8	23PCSC31	Web Application Development	6	5
		Core-9	23PCSC32	Robotic Process Automation	6	5
		Core-10	23PCSC33	Big Data Analytics	6	5
		Core-11	23PCSC34	Web Application Development - Lab	6	4
	B	EC-5	23PCSE31	Elective V (*Refer Elective List V)	3	3
		SEC 2	23PCSS31	Robotic Process Automation- Lab	3	2
	Internship	23PCSI35	Internship	-	2	
					30	26
IV	A	Core-12	23PCSC41	Digital Image Processing	6	5
		Core-13	23PCSC42	Digital Image Processing - Lab	6	5
		Project	23PCSP43	Project	10	7
	B	EC-6	23PCSE41	Elective VI (*Refer Elective List VI)	4	3
		SEC3	23PCSS41	Blockchain Technology	4	2
		Extension Activities		STAND (Student Training and Action for Neighbourhood Development)	-	1
						30
					120	91

ABBREVIATIONS

- C - Core
- EC -Elective Course
- SEC - Skill Enhancement Course
- I- Internship
- P-Project

LIST OF ELECTIVE COURSES

	SUBJECT CODE	TITLE OF PAPER
Elective I	23PCSE11	Advanced Software Engineering
		Dot Net Technologies
Elective II	23PCSE12	Analysis and Design of Algorithms-Lab
		Dot Net Technologies - Lab
Elective III	23PCSE21	Theory of Computation
		Computer Vision
Elective IV	23PCSE22	Advanced Java Programming-Lab
		Computer Vision-Lab
Elective V	23PCSE31	Network Security and Cryptography
		Deep Learning
Elective VI	23PCSE41	Internet of Things
		Social Networks

EXTRA CREDIT COURSES

SEM	SUBJECT CODE	TITLE OF PAPER
I	23PCSEC1	Web Designing with Bootstrap and JQuery
II	23PCSEC2	PC Assembling and Trouble Shooting
III	23PCSEC3	Green Computing
IV	23PCSEC4	Wireless Technology

VALUE ADDED COURSES

SUBJECT CODE	TITLE OF PAPER
23PCSVA1	Digital Forensics
23PCSVA2	Data Visualization
23PCSVA3	Cross Platform Application Development using React Native

SEMESTER I

Course code	23PCSC11	ANALYSIS AND DESIGN OF ALGORITHMS	HOURS	CREDITS
Core/Elective		CORE	5	4
Pre-requisite		Basic Data Structures & Algorithms		
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Remember about algorithms and determine their time complexity.			K1, K2
CO 2	Gain good understanding of Greedy method and its algorithm.			K2, K3
CO 3	Able to describe about graphs using Dynamic programming technique.			K3, K4
CO 4	Demonstrate the concept of backtracking and branch and Bound technique.			K5, K6
CO 5	Explore the Traversal and Searching technique and apply it for trees and graphs.			K5
CO 6	Create applications by applying various algorithms.			K6
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create				
UNIT I	INTRODUCTION			15 Hours
Introduction: - Algorithm Definition and Specification – Space complexity-Time Complexity-Asymptotic Notations - Elementary Data Structure: Stacks and Queues – Binary Tree - Binary Search Tree - Heap – Heapsort - Graph.				
UNIT II	TRAVERSAL AND SEARCH TECHNIQUES			15 Hours
Basic Traversal and Search Techniques: Techniques for Binary Trees - Techniques for Graphs - Divide and Conquer: - General Method - Binary Search - Merge Sort - Quick Sort.				
UNIT III	GREEDY METHOD			15 Hours
The Greedy Method: General Method – Knapsack Problem – Minimum Cost Spanning Tree – Single Source Shortest Path.				
UNIT IV	DYNAMIC PROGRAMMING			15 Hours
Dynamic Programming – General Method – Multistage Graphs – All Pair Shortest Path – Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.				
UNIT V	BACKTRACKING			15Hours
Backtracking: General Method – 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Branch and Bound: - The General Method – Traveling Salesperson Problem.				

TEXT BOOKS:	
1	Ellis Horowitz, "Computer Algorithms", 2 nd Edition Galgotia Publications, 1997.
2	Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", 1982.
REFERENCE BOOKS:	
1	Goodrich, "Data Structures and Algorithms in Java", Wiley 3 rd edition, 2003.
2	Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008
3	Anany Levith, "Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003.
4	Robert Sedgewick, Phillipe Flajolet, "An Introduction to the Analysis of Algorithms", Addison-Wesley Publishing Company, 1996.
WEB REFERENCES:	
1	https://nptel.ac.in/courses/106/106/106106131/
2	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3	https://www.javatpoint.com/daa-tutorial

Course code	23PCSC12	OBJECT ORIENTED ANALYSIS AND DESIGN	HOURS	CREDITS
Core/Elective	CORE		5	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand the concept of Object-Oriented development and modeling techniques			K1,K2
CO 2	Gain knowledge about the various steps performed during object design			K2,K3
CO 3	Abstract object-based views for generic software systems			K3
CO 4	Link OOAD with Object Oriented language			K4,K5
CO 5	Evaluate the basic concept of UML and create applications			K5,K6
CO 6	Create basic applications using OOAD concept			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	OBJECT MODEL			15 Hours
The Object Model: The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model. Classes and Objects: The Nature of an Object – Relationship among Objects.				
UNIT II	CLASSES AND OBJECTS			15 Hours
Classes and Object: Nature of Class – Relationship Among classes – The Interplay of classes and Objects. Classification: The importance of Proper Classification – Identifying classes and objects –Key Abstractions and Mechanism.				
UNIT III	DYNAMIC MODEL & FUNCTIONAL MODEL			15 Hours
Events and States – Operations– Concurrency – Relation of Object and Dynamic Models, Functional Modeling: Functional Models – Data Flow Diagrams – Specifying Operations – Constraints – Relation of Functional to Object and Dynamic Models - OMT as a Software Engineering Methodology – The OMT Methodology – Impact of an Object-Oriented Approach.				
UNIT IV	UNIFIED MODELING LANGUAGE			15 Hours
Views- use case view-logical view-implementation view-process view-deployment view-diagrams-use case diagram object diagram-state machine-Activity diagram-interaction diagram-component diagram-deployment diagram-composite structure diagram.				
UNIT V	USECASE MODELING			15 Hours
Basics of use cases - use case diagram – system - actors in UML - relationship between actors finding use cases - use cases in UML - relationship between use cases - generalization relationship - extend relationship - include relationship - organizing use cases - describing use cases - assessing use cases.				

TEXT BOOKS:	
1	Grady Booch ,“Object Oriented Analysis and Design with Applications”, Second Edition, Pearson Education.2007
2	James Rumbaugh Michael Blaha , William Premerlani, Frederick eddy and William Lorensen,”Object Oriented Modeling and Design” , Pearson Education India., Second edition,2011
3	Hans Erik Erikson, Magnus Penker, Brian Lyons,” UML 2 Tool kit” Wiley India Pvt. Ltd, OMG Press, 2008
REFERENCE BOOKS:	
1	Simon Bennett, Steve Mcrobb, Rayfarmer,” Object oriented system analysis and design using UML”, Tata – MC Graw Hill Publishing company Lmt, 2010
WEB REFERENCES:	
1	https://online.courses.nptel.ac.in/noc19_cs48/preview
2	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3	https://www.tutorialspoint.com/object_oriented_analysis_design/object_oriented_analysis.htm
4	https://ineed.coffee/uploads/object-oriented-memory-management-java-c++.pdf

Course Code	23PCSC13	PYTHON PROGRAMMING	HOURS	CREDITS
Core/Elective		CORE	5	4
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand the basic concepts of Python Programming			K1, K2
CO 2	Understand File operations, Classes, and Objects			K2, K3
CO 3	Acquire Object Oriented Skills in Python			K3, K4
CO 4	Develop web applications using Python			K5
CO 5	Develop Client-Server Networking applications			K5, K6
CO 6	Create applications based on Internet and Web services.			K6
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create				
UNIT I	INTRODUCTION			15 Hours
Python: Introduction–Numbers–Strings–Variables–Lists–Tuples–Dictionaries–Sets– Comparison.				
UNIT II	CODE STRUCTURES			15 Hours
Code Structures: if, elif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.				
UNIT III	MODULES, PACKAGES AND CLASSES			15Hours
Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. Objects and Classes: Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super–In self Defense –Get and Set Attribute Values with Properties –Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.				
UNIT IV	DATA TYPES AND WEB			15 Hours
Data Types: Text Strings–Binary Data. Storing and Retrieving Data: File Input/Output– Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores. Web: Web Clients –Web Servers–Web Services and Automation.				
UNIT V	SYSTEMS AND NETWORKS			15 Hours
Systems: Files–Directories–Programs and Processes–Calendars and Clocks. Concurrency: Queues– Processes–Threads–Green Threads and event–twisted–Redis. Networks: Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – Zero MQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and Map Reduce – Working in the Clouds.				

TEXT BOOKS:	
1	Bill Lubanovic, “Introducing Python”, O’Reilly, First Edition-SecondRelease,2014.
2	Mark Lutz, “Learning Python”, O’Reilly, Fifth Edition, 2013.
REFERENCE BOOKS:	
1	David M. Beazley, “Python Essential Reference”, Developer’s Library, Fourth Edition, 2009.
2	Sheetal Taneja, Naveen Kumar, “Python Programming - A Modular Approach”, Pearson Publications.2013
WEB REFERENCES:	
1	https://www.programiz.com/python-programming/
2	https://www.tutorialspoint.com/python/index.htm
3	https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Course Code	23PCSC14	PYTHON PROGRAMMING-LAB	HOURS	CREDITS
Core/Elective/Supportive	CORE		5	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Able to write programs in Python using OOPS concepts			K1,K2
CO 2	To understand the concepts of File operations and Modules in Python			K2,K3
CO 3	Implementation of lists, dictionaries, sets and tuples as programs			K3,K4
CO 4	To develop web applications using Python			K5,K6
CO 5	Evaluate the programs with the expected output.			K5
CO 6	Create applications based on the given domain.			K6
K1- Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
LIST OF PROGRAMS				75 Hours
<p>Implement the following in Python:</p> <ol style="list-style-type: none"> 1. Programs using elementary data items, lists, dictionaries and tuples 2. Programs using conditional branches, 3. Programs using loops. 4. Programs using functions 5. Programs using exception handling 6. Programs using inheritance 7. Programs using polymorphism 8. Programs to implement file operations. 9. Programs using modules. 10. Programs for creating dynamic and inter active web pages using forms. 				

ELECTIVE COURSES

ELECTIVE I

Course code	23PCSE11	ADVANCED SOFTWARE ENGINEERING	HOURS	CREDITS
Core/Elective/Supportive	ELECTIVE		5	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand about Software Engineering process			K1,K2
CO 2	Understand about Software project management skills, design and quality management			K2,K3
CO 3	Analyze on Software Requirements and Specification			K3,K4
CO 4	Analyze on Software Testing, Maintenance and Software Re-Engineering			K4,K5
CO 5	Design and conduct various types and levels of software quality for a software project			K5,K6
CO 6	Create applications based on Software Engineering Techniques.			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	INTRODUCTION			15 Hours
Introduction: The Problem Domain – Software Engineering Challenges - Software Engineering Approach – Software Processes: Software Process – Characteristics of a Software Process – Software Development Process Models – Other software processes.				
UNIT II	SOFTWARE REQUIREMENTS			15 Hours
Software Requirements Analysis and Specification: Requirement engineering – Type of Requirements – Feasibility Studies – Requirements Elicitation – Requirement Analysis – Requirement Documentation – Requirement Validation – Requirement Management – SRS - Formal System Specification – Axiomatic Specification – Algebraic Specification - Case study: Student Result management system. Software Quality Management –Software Quality, Software Quality Management System, ISO 9000, SEI CMM.				
UNIT III	PROJECT MANAGEMENT			15 Hours
Software Project Management: Responsibilities of a software project manager – Project planning – Metrics for Project size estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Halstead’s software science – Staffing level estimation – Scheduling– Organization and Team Structures – Staffing – Risk management – Software Configuration Management – Miscellaneous Plan.				
UNIT IV	SOFTWARE DESIGN			15 Hours
Software Design: Outcome of a Design process – Characteristics of a good software design – Cohesion and coupling - Strategy of Design – Function Oriented Design – Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.				

UNIT V	SOFTWARE TESTING	15 Hours
Software Testing: A Strategic approach to software testing – Terminologies – Functional testing– Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging–Testing tools-Metrics-ReliabilityEstimation.SoftwareMaintenance -Maintenance Process - Reverse Engineering – Software Re-engineering - Configuration Management Activities.		
TEXT BOOKS:		
1	An Integrated Approach to Software Engineering – Pankaj Jalote, Narosa Publishing House, Delhi, 3 rd Edition,2005	
2	Fundamentals of Software Engineering –Rajib Mall, PHI Publication, 3 rd Edition,2009	
REFERENCE BOOKS:		
1	Software Engineering–K.K. Aggarwal and Yogesh Singh, New Age International Publishers, 3 rd edition.2019	
2	A Practitioners Approach - Software Engineering, -R.S. Pressman, McGraw Hill,2018	
3	Fundamentals of Software Engineering - Carlo Ghezzi, M. Jarayeri, D. Manodrioli, PHI Publication,2007	
WEB REFERENCES:		
1	https://www.javatpoint.com/software-engineering-tutorial	
2	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview	
3	https://onlinecourses.nptel.ac.in/noc19_cs69/preview	

Course code	23PCSE11	DOT NET TECHNOLOGIES	HOURS	CREDITS
Core / Elective		ELECTIVE	5	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand and learn .NET Framework and C# .NET			K1,K2
CO 2	Apply the concepts to develop the applications for real-time problem in C# .NET and ASP .NET			K3
CO 3	Analyze the feasibility of using .NET for real time problems			K4,K5
CO 4	Create Applications using .NET Framework			K4,K5
CO 5	Design quality software projects for various Domains			K5,K6
CO 6	Create applications in cross platform basis.			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	INTRODUCTION			15 Hours
Introducing C#: .NET Framework - C# language - Visual Studio 2017 - Writing a C# Program: Visual Studio 2017 Development Environment - Console Applications - Desktop Applications - Variables and Expressions: Basic C# Syntax - Basic C# Console Application Structure - Variables - Expressions - Flow Control: Boolean Logic – Branching - Looping.				
UNIT II	FUNCTIONS AND OOP TECHNIQUES			15 Hours
More About Variables: Type Conversion - Complex Variable Types - String Manipulation – Functions: Defining and Using Functions - Variable Scope - The Main Function - Struct Functions - Overloading Functions - Using Delegates - Debugging and Error Handling: Debugging in Visual Studio - Error Handling - Introduction to Object Oriented Programming: Object-Oriented Programming - OOP Techniques - OOP in Desktop Applications				
UNIT III	CLASS AND INTERFACE			15 Hours
Defining Classes: Class Definitions in C# - System.Object - Constructors and Destructors - OOP Tools in Visual Studio - Class Library Projects - Interfaces Versus Abstract Classes - Struct Types - Shallow Copying Versus Deep Copying - Defining Class Members: Member Definitions - Additional Class Member Topics - Interface Implementation - Partial Class Definitions - Partial Method Definitions - The Call Hierarchy Window				
UNIT IV	CROSS PLATFORM BASICS			15 Hours
.NET Standard and .NET Core: Cross-Platform Basics– Need of .NET - Referencing & Targeting Frameworks - .NET Core - Building and Packaging a .NET Standard Library - Building a .NET Core Application with Visual Studio - Porting from .NET Framework to .NET Core - ASP.NET and ASP.NET Core: Overview of Web Applications – Use of ASP.NET - ASP.NET Web Forms - Creating ASP.NET Core Web Applications – Files: File Classes for Input and Output – Streams - Monitoring the File System - XML and JSON: XML Basics - JSON Basics - XML Schemas - XML Document Object Model				

UNIT V	LINQ AND DATABASE	15 Hours
LINQ: LINQ to XML - LINQ Providers - LINQ Query Syntax - LINQ Method Syntax - Ordering Query Results - Understanding the order by Clause - Querying a Large Data Set -Using Aggregate Operators - Using the Select Distinct Query - Ordering by Multiple Levels -Using Group Queries - Using Joins – Databases: Using Databases - Installing SQL Server - Express - Entity Framework - Code First Database - Finding the Database - Navigating Database Relationships - Handling Migrations - Creating and Querying XML from an Existing Database		
Total Lecture Hours		75 Hours
TEXT BOOK:		
1	Benjamin Perkins, Jacob Vibe Hammer, Jon D. Reid, “Beginning C#7 Programming with Visual Studio 2017”, Wiley Publishing, 2018.	
REFERENCE BOOKS:		
1	Nagel, Christian, “Professional C 7 and .NET Core 2.0”, Wrox Publishing, 2018.	
2	Mehboob Ahmed Khan, Ovais, “C# 7 and .NET Core 2.0 High Performance”, Packt Publishing, 2018	
WEB REFERENCES:		
1	https://dotnet.microsoft.com/en-us/learn/dotnet/what-is-dotnet	
2	https://www.javatpoint.com/net-framework	
3	https://www.w3schools.com/whatis/whatis_json.asp	

ELECTIVE II

Course Code	23PCSE12	ANALYSIS AND DESIGN OF ALGORITHMS-LAB	HOURS	CREDITS
Core/Elective/Supportive		ELECTIVE	5	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand the concepts of object oriented techniques with respect to C++			K1, K2
CO 2	Able to understand and implement OOPS concepts			K3, K4
CO 3	Implementation of data structures like Stack, Queue, Tree, List using C++			K4, K5
CO 4	Application of the data structures for Searching using different techniques.			K5, K6
CO 5	Application of the data structures for Sorting using different techniques.			K5, K6
CO 6	Create applications using Data Structure algorithms.			K6
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create				
LIST OF PROGRAMS				75Hours
<ol style="list-style-type: none"> 1. Write a program to solve the tower of Hanoi using recursion. 2. Write a program to implement stack using array. 3. Write a program to implement queue using array. 4. Write a program to implement circular queue using linked list. 5. Write a program to traverse through binary tree using inorder, preorder and postorder. 6. Write a program to search an element in array using binary search algorithm. 7. Write a program to sort an array of n elements using quick sort. 8. Write a program to sort an array of n elements using merge sort. 9. Write a program to sort number of elements in ascending order using heap sort. 10. Write a program to solve the knapsack problem using greedy method. 11. Write a program to construct minimum cost spanning tree using Prim's algorithm. 12. Write a program to construct minimum cost spanning tree using Kruskal's algorithm. 13. Write a program to solve single source shortest path problem. 14. Write a program to solve all pairs shortest path problem. 15. Write a program to place the 8 queens on an 8x8 matrix so that no two queens attack. 				

Course Code	23PCSE12	DOT-NET TECHNOLOGIES-LAB	HOURS	CREDITS
Core/Elective	ELECTIVE		5	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Get a strong understanding of .NET Visual Studio platform			K1, K2
CO 2	Become a strong knowledge in C# .NET.			K3, K4
CO 3	Getting real-time application developing using .NET Cloud Technologies.			K4, K5
CO 4	Create database applications			K5, K6
CO 5	Evaluate simple universal applications			K5, K6
CO 6	Create applications with database management.			K6
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create				
LIST OF PROGRAMS			75 Hours	
<ol style="list-style-type: none"> 1. Demonstrate method overloading and method overriding 2. Class and Objects 3. Multilevel Inheritance 4. Interfaces 5. Demonstrate multiple type of Exceptions 6. Azure Storage Container Using the Microsoft Azure Storage Client Library 7. Demonstrate Read and Write a Data using Random Access Files 8. Employee management database using LINQ 9. Student management system using ASP.NET 10. Demonstrates simple Universal App. 				

SEMESTER II

Course code	23PCSC21	DATAMINING AND WAREHOUSING	HOURS	CEDITS
Core/Elective		Core	6	5
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand the basic datamining techniques and algorithms			K1,K2
CO 2	Understand the Association rules, Clustering techniques and Data warehousing contents			K2,K3
CO 3	Compare and evaluate different datamining technique slike classification, prediction, Clustering and association rule mining			K4,K5
CO 4	Design data warehouse with dimensional modeling and apply OLAP operations			K5,K6
CO 5	Identify appropriate data mining algorithms to solve real world problems			K6
CO 6	Create data warehouse models			K6
K1-Remember;K2-Understand;K3-Apply; K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	BASICS AND TECHNIQUES			18 Hours
Basic data mining tasks – data mining versus knowledge discovery in databases – data mining issues – data mining metrics – social implications of data mining – data mining from a database perspective. Data mining techniques: Introduction – a statistical perspective on data mining – similarity measures – decision trees – neural networks – genetic algorithms.				
UNIT II	ALGORITHMS			18 Hours
Classification: Introduction –Statistical –based algorithms -distance–based algorithms-decision tree-based algorithms-neural network–based algorithms–rule-based algorithms–combining techniques.				
UNIT III	CLUSTERING AND ASSOCIATION			18 Hours
Clustering :Introduction–Similarity and Distance Measures–Outliers–Hierarchical Algorithms - Partitional Algorithms. Association rules: Introduction - large item sets - basic algorithms – parallel & distributed algorithms – comparing approaches- incremental rules – advanced association rules techniques – measuring the quality of rules.				
UNIT IV	DATA WAREHOUSING AND MODELING			18 Hours
Data ware housing: introduction-characteristics of a data ware house–datamarts–other aspects of data Mart. Online analytical processing: Introduction –OLTP & OLA Psystems Data modeling –star schema for multidimensional view –data modeling – multi - factstar schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.				
UNIT V	APPLICATIONS OF DATA WAREHOUSE			18 Hours
Developing a data WAREHOUSE: why and how to build a data warehouse –data warehouse architectural strategies and organization issues - design consideration – data content – metadata distribution of data – tools for data warehousing – performance considerations – crucial decisions in designing a data warehouse. Applications of data warehousing and data mining in government: Introduction - national data				

warehouses – other areas for data warehousing and data mining.	
Total Lecture hours	
90 Hours	
TEXT BOOKS:	
1	Margaret H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson education, 2003.
2	C.S.R. Prabhu, “Data Warehousing Concepts, Techniques, Products and Applications”, PHI, Second Edition, 2008.
REFERENCE BOOKS:	
1	Arun K .Pujari, “Data Mining Techniques”, Universities Press (India) Pvt. Ltd.,2003.
2	Alex Berson, Stephen J. Smith, “Data Warehousing, Data Mining and OLAP”, TMCH, 2001.
3	Jiawei Han & Micheline Kamber, Data Mining Concepts and Techniques”, Academic press, 2001.
WEB REFERENCES:	
1	https://www.javatpoint.com/data - warehouse
2	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3	https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html

SEMESTER II

Course code	23PCSC22	ADVANCED OPERATING SYSTEM	HOURS	CEDITS
Core/Elective		CORE	6	4
Pre-requisite	Basics of OS and its functioning			
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand the design issues associated with operating systems			K1,K2
CO 2	Master various process management concepts including scheduling, deadlocks and distributed file systems			K3,K4
CO 3	Prepare Real Time Task Scheduling			K4,K5
CO 4	Analyze Operating Systems for Hand held Systems			K5
CO 5	Analyze Operating Systems like LINUX and iOS			K5,K6
CO 6	Create customized process scheduling.			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	BASICS OF OPERATING SYSTEMS			18 Hours
Basics of Operating Systems: What is an Operating System? – Main frame Systems –Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems –Real-Time Systems – Handheld Systems – Feature Migration – Computing Environments -Process Scheduling – Cooperating Processes – Inter Process Communication- Deadlocks –Prevention – Avoidance – Detection – Recovery.				
UNIT II	DISTRIBUTED OPERATING SYSTEMS			18 Hours
Distributed Operating Systems: Issues – Communication Primitives – Lamport’s Logical Clocks – Deadlock handling strategies – Issues in deadlock detection and resolution-distributed file systems –design issues – Case studies – The Sun Network File System-Coda.				
UNIT III	REALTIME OPERATING SYSTEM			18 Hours
Real time Operating Systems : Introduction – Applications of Real Time Systems – Basic Model of Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling				
UNIT IV	HAND HELD SYSTEM			18 Hours
Operating Systems for Handheld Systems: Requirements –Technology Overview – Handheld Operating Systems – PalmOS – Symbian Operating System – Android – Architecture of android– Securing handheld systems.				
UNIT V	CASE STUDIES			18 Hours
Case Studies : Linux System: Introduction – Memory Management – Process Scheduling – Scheduling Policy - Managing I/O devices – Accessing Files- iOS : Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.				
TEXT BOOKS:				
1	Abraham Silbers chatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.			
2	Mukesh Singhal and Niranjana G. Shivaratri, “Advanced Concepts in Operating Systems –			

	Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.
REFERENCE BOOKS:	
1	Rajib Mall, “Real -Time Systems: Theory and Practice”, Pearson Education India, 2006.
2	Pramod Chandra P. Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
3	Daniel. P. Bovet & Marco Cesati, “ Understanding the Linux kernel”, 3 rd edition, O’Reilly, 2005
4	Neil Smyth, “iPhone iOS4 Development Essentials–Xcode”, Fourth Edition, Payload media, 2011.
WEB REFERENCES:	
1	https://onlinecourses.nptel.ac.in/noc20_cs04/preview
2	https://www.udacity.com/course/advanced-operating-systems--ud189
3	https://minnie.tuhs.org/CompArch/Resources/os-notes.pdf

Course code	23PCSC23	ADVANCED JAVA PROGRAMMING	HOURS	CEDITS
Core/Elective		CORE	6	5
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand the advanced concepts of Java Programming			K1,K2
CO 2	Understand JDBC and RMI concepts			K2,K3
CO 3	Apply and analyze Java in Database			K3,K4
CO 4	Handle different event in java using the delegation event model, event listener and class			K5
CO 5	Design interactive applications using Java Servlet, JSP and JDBC			K5,K6
CO 6	Create Swing Programs			K6
K1-Remember;K2-Understand;K3-Apply; K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	BASICS OF JAVA			18 Hours
Java Basics Review: Components and eventhandling – Threading concepts–Networking features – Media techniques				
UNIT II	REMOTE METHOD INVOCATION			18 Hours
Remote Method Invocation-Distributed Application Architecture- Creating stubs and skeletons- Defining Remote objects- Remote Object Activation-Object Serialization-Java Spaces				
UNIT III	DATABASE			18 Hours
Javain Databases-JDBC principles – database access-Interacting – database search–Creating multimedia databases – Database support in web applications				
UNIT IV	SERVLETS			18 Hours
Java Servlets: Java Servlet and CGI programming- A simple java Servlet-Anatomy of a java Servlet-Reading data from a client-Reading http request header-sending data to a client and writing the http response header-working with cookies Java Server Pages: JSP Overview-Installation-JSP tags-Components of a JSP page-Expressions-Scriptlets-Directives-Declarations-A complete example				
UNIT V	ADVANCED TECHNIQUES			18 Hours
JAR file format creation–Internationalization–Swing Programming–Advanced java techniques				
TEXT BOOKS:				
1	Jamie Jaworski,“Java Unleashed”, SAMS TechmediaPublications,1999.			
2	Campione,Walrath and Huml,“The JavaTutorial”,AddisonWesley,1999.			
REFERENCE BOOKS:				
1	Jim Keogh,“The Complete Reference J2EE”,TataMc Graw Hill PublishingCompanyLtd,2010.			
2	David Sawyer McFarland,“ Java Script And JQuery-The Missing Manual”, Oreilly Publications, 3 rd Edition,2011.			

3	Deitel and Deitel, “Java How to Program”, Third Edition, PHI Pearson Education Asia.,2014
WEB REFERENCES:	
1	https://www.javatpoint.com/servlet-tutorial
2	https://www.tutorialspoint.com/java/index.htm
3	https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Course code	23PCSE21	THEORY OF COMPUTATION	HOURS	CREDITS
Core/Elective		Elective	4	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Describe about Theory of Computation.			K1,K2
CO 2	Interpret automation theory in computation process .			K2,K3
CO 3	Apply the skill to develop Turing Machine .			K3,K4
CO 4	Illustrate about various Grammars and their patterns.			K4,K5
CO 5	Evaluate various types of Turing machine operations.			K4,K6
CO 6	Create and evaluate Computation Complexity in various levels.			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	INTRODUCTION			12 Hours
Introduction – Basic Definitions – Finite Automaton – DFA & N DFA – Finite Automaton with ϵ - transitions – Regular Language s- Regular Expression – Applications of Regular Expressions – Minimization of DFA.				
UNIT II	CONTEXT FREE GRAMMAR			12 Hours
Context-Free Languages: Context-Free Grammars-Examples of Context-Free Languages- Leftmost and Rightmost Derivations-Derivation Trees- -Parsing and Ambiguity-Ambiguity in Grammars and Languages- Context-Free Grammars and Programming Languages-Two important Normal Forms.				
UNIT III	PUSHDOWN AUTOMATA			12 Hours
Pushdown Automata: Non-deterministic Pushdown Automata-Definition of a Pushdown Automaton-The Language Accepted by a Pushdown Automaton- Pushdown Automata and Context-Free Languages-Pushdown Automata for Context-Free Languages-Context-Free Grammars for Pushdown Automata-Deterministic Pushdown Automata and Deterministic Context-Free Languages- Grammars for Deterministic Context-Free Languages				
UNIT IV	TURING MACHINE			12 Hours
Turing Machines: The Standard Turing Machine-Definition of a Turing Machine- Combining Turing Machines for Complicated Tasks- Minor Variations on the Turing Machine Theme-Turing Machines with More Complex Storage-Multi-tape Turing Machines-Multidimensional Turing Machines-Nondeterministic Turing Machines-A Universal Turing Machine- Linear Bounded Automata.				
UNIT V	COMPUTATIONAL COMPLEXITY			12 Hours
A Hierarchy of Formal Languages and Automata: Recursive and Recursively Enumerable - Unrestricted -The Chomsky Hierarchy. An Overview of Computational Complexity: Efficiency of Computation- Turing Machine Models and Complexity- Language Families and Complexity Classes- The Complexity Classes P and NP - NP Problems- Polynomial-Time Reduction				
TEXT BOOKS:				
I.Hopcroft J. E., Motwani R and Ullman J. D, “ Introduction to Automata Theory, languages and Computations”, Second Edition, Pearson education, 2008				

2.Peter Linz,” An Introduction to formal Languages and Automata” Fifth Edition, Jones & Bartlett Learning, 2012

REFERENCE BOOK:

1.John C. Martin, “Introduction to the Languages and the Theory of Computation”, Third Edition, Tata McGrawHill Publishing Company, New Delhi 2007

WEB REFERENCES:

1	www.geeksforgeeks.org/introduction-of-theory-of-computation
2	www.tutorialspoint.com/what-is-the-theory-of-computation
3	www.techslang.com/definition/what-is-the-theory-of-computation

Course code	23PCSE21	COMPUTER VISION	HOURS	CREDITS
Core/Elective		Elective	4	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	To understand and recall computer vision and its application areas			K1,K2
CO 2	To develop build a computer vision system			K2,K3
CO 3	To apply and analyze a design range of algorithms for image processing and computer vision			K3,K4
CO 4	To develop incorporate machine learning techniques with computer vision system			K4,K5
CO 5	To apply and analyze image segmentation and image registration			K4,K6
CO 6	Create Image segmentations projects.			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	BASIC IMAGE HANDLING AND PROCESSING			12 Hours
Basic Image Handling and Processing: PIL – the Python Imaging Library-Matplotlib -NumPy-SciPy-Advanced example: Image de-noising. Local Image Descriptors: Harris corner detector-SIFT - Scale-Invariant Feature Transform-Matching Geotagged Images.				
UNIT II	Image to Image Mapping AND AR			12 Hours
Image to Image Mappings: Homographies-Warping images-Creating Panoramas. Camera Models and Augmented Reality: The Pin-hole Camera Model-Camera Calibration-Pose Estimation from Planes and Markers-Augmented Reality.				
UNIT III	MULTIPLE VIEW GEOMETRY			12 Hours
Multiple View Geometry: Epipolar Geometry-Computing with Cameras and 3D Structure-Multiple View Reconstruction-Stereo Images. Clustering Images: K-means Clustering-Hierarchical Clustering-Spectral Clustering.				
UNIT IV	SEARCHING AND CLASSIFICATION IMAGES			12 Hours
Searching Images: Content based Image Retrieval-Visual Words-Indexing Images- Searching the Database for Images-Ranking Results using Geometry-Building Demos and Web Applications. Classifying Image Content: K-Nearest Neighbors-Bayes Classifier-Support Vector Machines-Optical Character Recognition.				
UNIT V	IMAGE SEGMENTATION AND OPENCV			12 Hours
Image Segmentation: Graph Cuts-Segmentation using Clustering-Variational Methods. Open CV: Python Interface-Open CV Basics-Processing Video-Tracking.				
TEXT BOOKS:				
1. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press ,First edition, 2012				
2.Richard Szeliski, "Computer Vision :Algorithms and Applications", University of Washington,2022				
REFERENCE BOOK:				

1.Scott Krig, “Computer Vision Metrics: Survey, Taxonomy, and Analysis”, Apress OPEN,2014

WEB REFERENCES:

1	https://www.simplilearn.com/computer-vision-article
2	https://www.javatpoint.com/computer-vision
3	https://www.sas.com/en_in/insights/analytics/computer-vision.html

ELECTIVE IV

Course Code	23PCSE22	ADVANCED JAVA PROGRAMMING - LAB	HOURS	CREDITS
Core/Elective		Elective	4	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand the concepts of Java using HTML forms, JSP & JAR			K1,K2
CO 2	Must be capable of implementing JDBC and RMI concepts			K3,K4
CO 3	Able to write Applets with Event handling mechanism			K4,K5
CO 4	Create interactive web based applications using servlets and JSP			K5,K6
CO 5	Evaluate the service of Client Server based applications			K5
CO 6	Create various applet programs			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
LIST OF PROGRAMS				
<ol style="list-style-type: none"> 1. Display a welcome message using Servlet. 2. Design a Purchase Order form using Html form and Servlet. 3. Develop a program for calculating the percentage of marks of a student using JSP. 4. Design a Purchase Order form using Html form and JSP. 5. Prepare a Employee pay slip using JSP. 6. Write a program using JDBC for creating at able, Inserting, Deleting records and list out there cords. 7. Write a program using Java servlet to handle form data. 8. Write a simple Servlet program to create a table of all the headers it receives along with their associated values. 9. Write a program in JSP by using session object. 10. Write a program to build a simple Client Server application using RMI. 11. Create an applet for a calculator application. 12. Program to send a text message to another system and receive the text message from the system (use socket programming). 				

ELECTIVE IV

Course Code	23PCSE22	COMPUTER VISION - LAB	HOURS	CREDITS
Core/Elective/Supportive	Elective		4	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	To develop and implement the image loading and exploring			K1,K2
CO 2	To Evaluate the image transforms			K3,K4
CO 3	To apply and analyze for image processing de-noising algorithms			K4,K5
CO 4	To design and develop the Image Segmentation using Edge detection and Histograms			K5,K6
CO 5	To apply and analyze image clustering and classification algorithms			K5,K6
CO 6	Create classification based applications.			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
LISTOF PROGRAMS				
<ol style="list-style-type: none"> 1. Image Loading, Exploring, and displaying an Image. 2. Access and Manipulate of Image Pixels. 3. Image Transformations. <ol style="list-style-type: none"> i) Resizing ii) Rotation 4. Addition operation of Two Images. 5. Image filtering operations <ol style="list-style-type: none"> i) Mean Filtering ii) Gaussian Filtering 6. Image Binarization Using Simple Thresholding method. 7. Edge Detection operation using Sobel and Scharr Gradients. 8. Find Grayscale and RGB Histograms of an Image. 9. Segment an Image using K-means Clustering algorithm. 10. Write a program to classify an Image using KNN Classification algorithm 				

SEMESTER II

CourseCode	23PCSS21	DATA MINING USING R-LAB	HOURS	CEDITS
Core/Elective		SEC	4	2
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Able to write programs using R for Association rules, Clustering techniques			K1,K2
CO 2	To implement data mining techniques like classification, prediction			K2,K3
CO 3	Able to use different visualizations techniques using R			K4,K5
CO 4	To apply different data mining algorithms to solve real world applications			K5,K6
CO 5	Evaluate various visualization techniques.			K5
CO 6	Create visualizations for various applications			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
LIST OF PROGRAMS				
<ol style="list-style-type: none"> 1. Implement Apriori algorithm to extract association rule of datamining. 2. Implement k-means clustering technique. 3. Implement any one Hierarchal Clustering. 4. Implement Classification algorithm. 5. Implement Decision Tree. 6. Linear Regression. 7. Data Visualization. 				

SEMESTER III

Course Code	23PCSC31	WEB APPLICATION DEVELOPMENT	HOURS	CREDITS
Core/Elective		ELECTIVE	6	5
COURSE OUTCOMES:				
On the successful completion of the course, students will be able to:				
CO 1	Demonstrate the ability to create a complete, functional web application			K1, K2
CO 2	Understand the basics of database design and management.			K2
CO 3	Apply server-side programming language frameworks			K3, K4
CO 4	Implement testing strategies for web applications			K5
CO 5	Evaluate responsive web designs that adapt to various screen sizes			K5, K6
CO 6	Create AJAX based applications			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	BOOTSTRAP		18 Hours	
Bootstrap: Introduction - Basic Example - Container - Jumbotron - Button - Grid - Table - Form - Alert - Wells - Badge - Panels - Image - Glyphicon - Carousel - List Group - Dropdown - Collapse - Tabs - Navbar - Input types - Modals – Popover				
UNIT II	INTRODUCTION TO JAVASCRIPT AND PHP		18 Hours	
JavaScript: Introduction - Basic Example - Internal and External Javascript - Comment - Variable - Function - Control Statements - Loops - JS Objects: Js Object - Array - String - Math. JS DOM: Document Object – get ElementById - getElementsByName() - getElementsByTagName() – innerHTML - innerText.PHP& MySQL: Connecting to MySQL - Making MySQL Queries - Basic CRUD Operations using PHP and MySQL				
UNIT III	OVERVIEW OF LARAVEL FRAMEWORK		18 Hours	
Laravel: Overview - Features - MVC Architecture - Advantages of Laravel - Installation - Application Structure - Configuration - Routing - Middleware - Namespaces - Controllers.				
UNIT IV	HANDLING FORMS AND BLADE		18 Hours	
Laravel: Request - Cookie - Session - Response - Forms - Views - Blade - Redirections - Working with database - Errors and Logging - Localization.				
UNIT V	SECURITY AND EVENT HANDLING		18 Hours	
Laravel: Validation - File uploading - Sending Email - AJAX - Error Handling - Event Handling - CSRF Protection- CSRF Tokens – Header for CSRF.				
TEXT BOOKS:				
1	Paul Deital, Harvey Deitel & Abbey Deitel, "Internet and World Wide Web - How to Program", Pearson, Fifth Edition, 2012			
2	Matt Lambert, "Learning Bootstrap 4", Packt Publishing, Second Edition, 2016			
3	Steve Suehring, Tim Converse and Joyce Park, "PHP 6 and MySQL Bible", Wiley India Pvt. Ltd.(Reprint 2014)			
4	Matt Stauffer, "Laravel Up & Running", O' Reilly Media, 2017			

REFERENCE BOOKS:	
1	W. Jason Gilmore, "Beginning PHP and MySQL from Novice to Professional", Second Edition, Apress, 2007.
2	Nathan Wu, "Learning Laravel 5", 2016
WEB REFERENCES:	
1. https://www.geeksforgeeks.org/bootstrap/	
2. https://javascript.info/	
3. https://laravel.com/docs/10.x	

SEMESTER III

Course Code	23PCSC32	ROBOTICS PROCESS AUTOMATION	HOURS	CREDITS
Core /Elective		Core	6	5
COURSE OUTCOMES:				
On the successful completion of the course, students will be able to:				
CO 1	Demonstrate the benefits and ethics of RPA			K1, K2
CO 2	Understand the Automation cycle and its techniques			K2
CO 3	Draw inferences and information processing of RPA			K3, K4
CO 4	Implement and apply RPA in Business Scenarios			K5
CO 5	Analyze on Robots & leveraging automation			K5, K6
CO 6	Create bots for various domains			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	INTRODUCTION TO ROBOTIC PROCESS AUTOMATION		18 Hours	
Scope and automation techniques, Robotic process automation - What can RPA do? Benefits of RPA, Components of RPA, RPA platforms, The future of automation. RPA BASICS: History of Automation - What is RPA - RPA vs Automation - Processes & amp; Flowcharts - Programming Constructs in RPA – What Processes can be Automated - Types of Bots - Workloads which can be automated - RPA Advanced Concepts - Standardization of processes - RPA Development methodologies - Difference from SDLC - Robotic control flow architecture				
UNIT II	RPA TOOL INTRODUCTION AND BASICS		18 Hours	
Introduction to RPA Tool - The User Interface - Variables - Managing Variables - Naming Best Practices – The Variables Panel - Generic Value Variables - Text Variables - True or False Variables - Number Variables – Array Variables - Date and Time Variables - Data Table Variables – Managing Arguments - Naming Best Practices – The Arguments Panel - Using Arguments - About Imported Namespaces - Importing New Namespaces- Control Flow -Control Flow Introduction - If Else Statements - Loops - Advanced Control Flow - Sequences - Flowcharts – About Control Flow – Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity – The Switch Activity - The While Activity - The For Each Activity - The Break Activity - Data Manipulation-Data Manipulation Introduction - Scalar variables, collections and Tables - Text Manipulation – Data Manipulation				
UNIT III	ADVANCED AUTOMATION CONCEPTS AND TECHNIQUES		18 Hours	
Recording Introduction - Basic and Desktop Recording - Web Recording – Input / Output Methods - Screen Scraping - Data Scraping - Scraping Advanced Techniques - Selectors - Defining and Assessing Selectors - Customization -Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image, Text & amp; Advanced Citrix Automation Tables and amp; PDF - Data Tables in RPA - Excel and Data Table basics - Data Manipulation in excel				
UNIT IV	HANDLING USER EVENTS AND ASSISTANT BOTS, EXCEPTION HANDLING		18 Hours	
What are assistant bots? - Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger -Monitoring image and element triggers - An example of monitoring email - Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event				
UNIT V	DEPLOYING AND MAINTAINING THE BOT		18 Hours	
Publishing using publish utility - Creation of Server - Using Server to control the bots - Creating a provision Robot from the Server - Connecting a Robot to Server - Deploy the Robot to Server - Publishing and				

managing updates -Managing packages - Uploading packages - Deleting packages

TEXT BOOK:

1. Alok Mani Tripathi, “Learning Robotic Process Automation”, Packt Publishing, 2018.

REFERENCE BOOKS:

1. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, “Introduction to Robotic Process Automation: a Primer”, Institute of Robotic Process Automation,1st Edition 2015.
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant”, Independently Published, 1st Edition 2018.
3. Srikanth Merianda,”Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation”, Consulting Opportunity Holdings LLC, 1st Edition 2018.
4. Lim Mei Ying, “Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes”, Packt Publishing, 1st Edition 2018.

WEB REFERENCES:

1. <https://www.uipath.com/learning/video-tutorials>
2. https://www.youtube.com/watch?v=kVtgA_PQ5R4
3. https://onlinecourses.nptel.ac.in/noc19_me74/preview

SEMESTER III

Course code	23PCSC33	BIG DATA ANALYTICS	HOURS	CREDITS
Core/Elective		Core	6	5
Course Outcomes:				
On the successful completion of the course, student will be able to:				
1	Understand the basic concepts of Big data			K2
2	Use Big data Patterns			K3
3	Apply NoSQL in Business Applications			K3
4	Using Frameworks and Visualization in real time			K3
5	Analyze various methods of Data Analysis			K5
6	Create and compare usage of Relational and Non-relational databases			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5 -Evaluate; K6-Create				
Unit:I	INTRODUCTION			18 Hours
Introduction to Big Data : Types of analytics -Big Data characteristics – Domain Specific Examples of Big data - Analytics flow for Big Data - Big Data stack – Setting up Big Data Stack –HDP - Cloudera CDH –EMR -Azure HDInsight				
Unit:II	PATTERNS AND No SQL			18 Hours
Big Data Patterns - Analytics Architecture Components and Design Styles –Map Reduce patterns No SQL Databases - Key-value databases - Document databases - Column Family databases - Graph databases				
Unit:III	BIG DATA ANALYTICS IMPLEMENTATION			18 Hours
Data acquisition - Considerations - Publish - Subscribe Messaging Frameworks - Big Data Collection Systems - Messaging queues - Custom connectors - Big Data storage – HDFS				
Unit:IV	ANALYSIS AND QUERYING			18 Hours
Batch Data analysis - Hadoop and MapReduce – Examples - Pig - Apache Oozie - Spark – Search - Real-time Analysis -Stream processing - Storm Case Studies -In-memory processing - Spark Case Studies - Streaming - Interactive querying –Hive -Spark SQL –Amazon Redshift – Google BigQuery				
Unit:V	FRAMEWORKS AND DATA VISUALIZATION			18 Hours
Web Frameworks and Serving Databases –Relational and Non-Relational Databases - Django - Python Web Application Framework –Spark MLib -H2O - Data Visualization - Building visualizations with Lightning, Pygal and Seaborn–Visualization Examples				
TEXT BOOK:				
1	Arshdeep Bahga & Vijay Madiseti , “Big Data Analytics: A Hands - On Approach”, 2019.			
REFERENCE BOOKS:				
1	Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley Publications, First Edition, 2015			

2	Tom White, "Hadoop The Definitive Guide", O'Reilly Publications, Fourth Edition, 2015
3	Vignesh Prajapati, "Big Data Analytics with R and Hadoop" , Packt Publishing, 2013
WEB REFERENCES:	
1	https://intellipaat.com/blog/tutorial/hadoop-tutorial/big-data-overview/
2	https://pratikbarjatya.medium.com/using-nosql-databases-for-big-data-storage-and-retrieval-446350d1603b
3	https://www.infoworld.com/article/3236869/what-is-apache-spark-the-big-data-platform-that-crushed-hadoop.html

SEMESTER III

Course Code	23PCSC34	WEB APPLICATION DEVELOPMENT - LAB	HOURS	CREDITS
Core/Elective		ELECTIVE	6	4
COURSE OUTCOMES:				
On the successful completion of the course, students will be able to:				
CO 1	Use the concepts of web application development			K1, K3
CO 2	Apply JavaScript as a dynamic webpage-creating tool			K3
CO 3	Demonstrate PHP as a server-side programming language			K3, K4
CO 4	Integrate various techniques to develop creative web applications			K5
CO 5	Evaluate the applications using MySQL as a backend with PHP			K5, K6
CO 6	Create applications for various domains			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
LAB PROGRAMS			90 Hours	
<ol style="list-style-type: none"> 1. Bootstrap Containers and grid 2. Bootstrap tables 3. Bootstrap alert, Badge and models 4. Bootstrap collapse and Tabs 5. Form validation using JavaScript 6. Calculator using JavaScript and AJAX 7. Store Student Marks in Database 8. Display Student marks from Database 9. Login form using cookies & session 10. Simple Laravel Program 11. Program using Routing 12. Employee Profile 13. Forms using CSRF Protection 14. Program using cookies 15. Form validations 16. Registration form using database 				

ELECTIVE V

Course code	21PCSE31	NETWORK SECURITY AND CRYPTOGRAPHY	HOURS	CREDITS
Core/Elective		Core	3	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand the process of the cryptographic algorithms			K1,K2
CO 2	Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication			K2,K3
CO 3	Apply and analyze appropriate security techniques to solve network security problem			K3,K4
CO 4	Explore suitable cryptographic algorithms			K4,K5
CO 5	Analyze different digital signature algorithms to achieve authentication and design secure applications			K5,K6
CO 6	Create Cryptography for various domains.			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	INTRODUCTION			9 Hours
Introduction to Cryptography – Security Attacks – Security Services –Security Algorithm- Stream cipher and Block cipher - Symmetric and Asymmetric-key Cryptosystem Symmetric Key Algorithms: Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.				
UNIT II	CRYPTOSYSTEM			9 Hours
Public-key Cryptosystem: Introduction to Number Theory-RSA Algorithm–Key Management -Diffie-Hellman Key exchange–Elliptic Curve Cryptography Message Authentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.				
UNIT III	NETWORK SECURITY			9 Hours
Network Security Practice: Authentication Applications–Kerberos–X.509 Authentication services and Encryption Techniques. E-mail Security – PGP – S / MIME – IP Security.				
UNIT IV	WEB SECURITY			9 Hours
Web Security-Secure Socket Layer–Secure Electronic Transaction System Security-Intruders and Viruses – Firewalls– Password Security.				
UNIT V	CASE STUDY			9 Hours
Case Study: Implementation of Cryptographic Algorithms–RSA–DSA–ECC(C/JAVA Programming).				
Network Forensic – Security Audit - Other Security Mechanism: Introduction to: Stenography –Quantum Cryptography – Water Marking - DNA Cryptography				
TEXT BOOKS:				
1	William Stallings,“Cryptography and Network Security”, PHI/Pearson Education.2017			
2	Bruce Schneir,“ Applied Cryptography”, CRC Press.2016			

REFERENCE BOOKS:	
1	A.Menezes, P Van Oorschot and S.Vanstone, "Hand Book of Applied Cryptography", CRC Press, 1997
2	Ankit Fadia,"Network Security", MacMillan.
WEB REFERENCES:	
1	https://nptel.ac.in/courses/106/105/106105031/
2	http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html
3	https://www.tutorialspoint.com/cryptography/index.htm

ELECTIVE V

Course code	21PCSE31	DEEP LEARNING	HOURS	CREDITS
Core/Elective/Supportive	Core		3	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	To remember the basics in deep networks and machine learning			K1
CO 2	To understand the CNN learning			K2
CO 3	To apply CNN architectures of deep neural networks			K3
CO 4	To analyze the performance of model			K4
CO 5	To evaluate auto-encoders and generative models for suitable applications			K5
CO 6	To create Deep Learning Models			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	DEEP NETWORKS BASICS			9 Hours
Linear Algebra : Scalars-Vectors-Matrices and tensors; Probability Distributions-Gradient-based Optimization. Machine Learning Basics : Capacity-Overfitting and underfitting-Hyperparameters and validation sets-Estimators-Bias and variance-Stochastic gradient descent-Challenges motivating deep learning; Deep Networks : Deep feedforward networks; Regularization - Optimization.				
UNIT II	CONVOLUTIONAL NEURAL NETWORKS			9 Hours
Convolution Operation-Sparse Interactions-Parameter Sharing-Equivariance-Pooling-Convolution Variants: Strided-Tiled-Transposed and dilated convolutions ; CNN Learning : Nonlinearity Functions-Loss Functions-Regularization-Optimizers-Gradient Computation.				
UNIT III	RECURRENT NEURAL NETWORKS			9 Hours
Unfolding Graphs-RNN Design Patterns : Acceptor-Encoder-Transducer; Gradient Computation-Sequence Modeling Conditioned on Contexts-Bidirectional RNN-Sequence to Sequence RNN-Deep Recurrent Networks-Recursive Neural Networks-Long Term Dependencies ; Leaky Units : Skip connections and dropouts ; Gated Architecture : LSTM.				
UNIT IV	MODEL EVALUATION			9 Hours
Performance metrics-Baseline Models-Hyper parameters: Manual Hyper parameter-Automatic Hyper parameter-Grid search-Random search-Debugging strategies.				
UNIT V	AUTO ENCODERS AND GENERATIVE MODELS			9 Hours
Autoencoders :Under complete auto encoders-Regularized auto encoders-Stochastic encoders and decoders-Learning with autoencoders ; Deep Generative Models : Variational auto encoders-Generative adversarial networks.				
TEXT BOOK:				
1	Ian Goodfellow, Yoshua Bengio, Aaron Courville. Deep Learning, MIT Press, 2016			
REFERENCE BOOKS:				
1	Nikhil Buduma, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithm”, O’Reilly, 2017.			

2	Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
WEB REFERENCES:	
1	https://www.geeksforgeeks.org/introduction-deep-learning/
2	https://www.geeksforgeeks.org/auto-encoders/
3	https://www.javatpoint.com/hyperparameters-in-machine-learning

SEMESTER III

Course Code	23PCSS31	ROBOTICS PROCESS AUTOMATION - LAB	HOURS	CREDITS
Core/Elective		ELECTIVE	3	2
COURSE OUTCOMES:				
On the successful completion of the course, students will be able to:				
CO 1	Become adept in automating Windows, web, and Java-based applications			K1, K2
CO 2	Understand fundamental UI automation concepts			K2
CO 3	Apply and Analyzethe ability to create and debug workflows using UiPath			K3, K4
CO 4	Master installation of UiPath Studio on Windows			K5
CO 5	Create and implement error exception handling in UiPath			K5
CO 6	Create applications using RPA			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
LIST OF PROGRAMS			45 Hours	
<ol style="list-style-type: none"> 1.Create a sequence that asks the user for his first and last name, and gives him choices to order from his favourite snacks, and then displays his answers. 2. Write a program to calculate the current age. 3. Design a Process to perform a basic calculation using Arguments. 4.Build a Guessing game using a Flow Chart 5.Design a workflow for transactional process using State Machine 6. Create a workflow that shows the welcome message only if the user enters the correct password. 7. Design a workflow for an integer variable will increase from 5 to 50 in increments of 5. 8.Create an automation process that goes through each element of an array write the length of array and each element to output panel. 9.Design a process to read all PDF files from a folder and then close them all. 10.Automate word file using basic recording 11.Automate Calculator Application using Desktop recoding 12. Design a process to Extract Initial name from full name 13. Design a process to read text from multiple word documents 14. Design a process to Merge Multiple word files into one file 15.Create an automation for PDF to Text Conversion 				

SEMESTER IV

Course Code	23PCSC41	DIGITAL IMAGE PROCESSING	HOURS	CREDITS
Core/Elective		Core	6	5
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Understand the fundamentals of Digital Image Processing			K1,K2
CO 2	Understand the mathematical foundations for digital image representation, image acquisition, image transformation, and image enhancement			K2,K3
CO 3	Apply, Design and Implement and get solutions for digital image processing problems			K3,K4
CO 4	Apply the concepts of filtering and segmentation for digital image retrieval			K4,K5
CO 5	Explore the concepts of Multi-resolution process and recognize the objects in an efficient manner			K5,K6
CO 6	Create Image Segmentation applications			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	INTRODUCTION			18 Hours
Introduction: What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital Image Fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization – Some Basic relationship between Pixels – Linear & Nonlinear operations.				
UNIT II	IMAGE ENHANCEMENT			18 Hours
Image Enhancement in the spatial domain:- Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.				
UNIT III	IMAGE RESTORATION			18 Hours
Image Restoration: A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering – Constrained least squares filtering – Geometric mean filter – Geometric Transformations.				
UNIT IV	IMAGE COMPRESSION			18 Hours
Image Compression: Fundamentals–Image compression models–Elements of Information Theory – Error Free compression –Lossless compression: Variable length coding – LZW coding – Bit plane codingpredictive coding-Lossy compression – Transform coding – Wavelet coding -Image compression standards.				

UNIT V	IMAGE SEGMENTATION	18 Hours
Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction – Thresholding – Region-Based segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation.		
TEXT BOOKS:		
1	Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Second Edition, PHI/Pearson Education.	
2	B. Chanda, D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2003.	
REFERENCE BOOKS:		
1	Nick Efford, “Digital Image Processing a practical introducing using Java”, Pearson Education, 2004.	
WEB REFERENCES:		
1	https://nptel.ac.in/courses/117/105/117105135/	
2	https://www.tutorialspoint.com/dip/index.htm	
3	https://www.javatpoint.com/digital-image-processing-tutorial	

SEMESTER IV

Course code	23PCSC42	DIGITAL IMAGE PROCESSING -LAB	HOURS	CREDITS
Core/Elective/Supportive	Core		6	5
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	To write programs in MATLAB for image processing using the techniques			K1,K2
CO 2	To implement Image Enhancements & Restoration techniques			K2,K3
CO 3	Capable of using Compression techniques in an Image			K3,K4
CO 4	Analyze various Segmentation algorithms.			K5,K6
CO 5	Evaluate the compression results.			K5
CO 6	Create image processing based projects.			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
LIST OF PROGRAMS				90 Hours
<ol style="list-style-type: none"> 1. Implement Image enhancement Technique. 2. Histogram Equalization 3. Image Restoration. 4. Implement Image Filtering. 5. Edge detection using Operators(Roberts, Prewitts and Sobels operators) 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation 				

ELECTIVE VI

Course code	23PCSE41	INTERNET OF THINGS	HOURS	CREDITS
Core/Elective		ELECTIVE	4	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Comprehend the IoT evolution with its architecture and sensors			K2
CO 2	Understand the networking concepts for communication and underlying IoT protocols			K3
CO 3	Assess the embedded technologies and develop prototypes for the IoT products			K3
CO 4	Evaluate the use of Application Programming Interface and design an API for IoT in real Time			K4
CO 5	Recognize the ethics of business models and perform security analysis			K5
CO 6	Create IoT Concepts in Business Model and Apply Business Ethics			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5 -Evaluate; K6-Create				
UNIT I				
FUNDAMENTALS OF IOT			12 Hours	
Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack -- Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.				
UNIT II				
IOT PROTOCOLS			12 Hours	
IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15. 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IOT: From 6LoWPAN to 6L Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.				
UNIT III				
DESIGN AND DEVELOPMENT			12 Hours	
Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. Prototyping the Physical Design: Non digital Methods – Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.				
UNIT IV				
PROTOTYPING			12 Hours	
Prototyping Online Components: Getting started with an API - Writing a New API Real-Time Reactions - Other Protocols. Techniques for Writing Embedded Code: Memo Management - Performance and Battery Life – Libraries – Debugging.				

UNIT V	BUSINESS MODEL AND ETHICS	12 Hours
Business Models: History of Business Models – Model – Internet of Starting up–Lean Startups. Moving to Manufacture: Designing Kits - Designing Printed circuit boards – Certification Costs - Scaling Up Software. Ethics: Privacy – Control – Environment – Solutions.		
TEXT BOOKS:		
1	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017 (UNIT I and II)	
2	Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014. (UNIT III, IV and V)	
REFERENCE BOOKS:		
1	OvidiuVermesan and Peter Friess, “Internet of Things – From Research and Innovation to Market Deployment” , River Publishers, 2014.	
2	Peter Waher, “Learning Internet of Things” ,Packt Publishing, 2015.	
3	Donald Norris, “The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black”,Mc Graw Hill, 2015.	
WEB REFERENCES:		
1	https://www.geeksforgeeks.org/deep-learning-tutorial	
2	https://www.javatpoint.com/data-science	
3	https://nptel.ac.in/courses/106/106/106106179/	

ELECTIVE VI

Course code	23PCSE41	SOCIAL NETWORKS	HOURS	CREDITS
Core/Elective		ELECTIVE	4	3
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	To understand, impart and summarize the concepts of Social media, Social networking and Webcasts			K2
CO 2	To comprehend, design and develop a Word Press Powered Website			K3
CO 3	To understand, implement and perform evaluation of Social Networking and Micro-Blogging			K2, K6
CO 4	To collaborate, implement and analyse the Widgets and Badges in social networking environment			K4
CO 5	To understand, illustrate and perform evaluation of web optimization for social networks			K5
CO 6	To create a social media strategy			K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I		INTRODUCTION		12 Hours
Introduction: Social Media Strategy-Important First Decisions -Websites, Blogs - RSS Feeds Mapping - Preparation - Multimedia Items Gathering Content for Blog Posts RSS Feeds & Blogs-RSS Feeds-The Feed Reader-The Feed-Options for Creating an RSS Feed-Planning Feed-Blogs-Options for Starting. Blog and RSS Feed-Feed or Blog Content-Search Engine Optimization (SEO)-Feed Burner-RSS Feed and Blog Directories-An Optimization Plan for Blog or RSS Feed				
UNIT II		BUILDING A WORD PRESS POWERED WEBSITE		12 Hours
Building a Word Press Powered Website: Word Press as A CMS - Diversity of Word Press Sites-The Anatomy of a Word Press Site -a Brief Look at the Word Press Dashboard Planning - Site Themes Plug-ins setting up Sidebars Building Pages- Posting Blog Entries. Podcasting, Vidcasting, & Webcasting- Publishing Options for Podcast- Creating and Uploading Podcast Episodes-Publishing Podcast Optimizing Podcast- Webcasting				
UNIT III		SOCIAL NETWORKING AND MICROBLOGGING		12 Hours
Social Networking and Micro-Blogging: Facebook-The Facebook Profile -Myspace LinkedIn-Twitter-Niche Social networking Sites-Creating Own Social Network-Promoting Social Networking Presence-Social Bookmarking and Crowd-Sourcing - Social Bookmarking-A Social Bookmarking Strategy-Crowd-Sourced News Sites- Preparation And Tracking Progress Media Communities-Image Sharing Sites-Image Sharing Strategy-Video Sharing Sites-Video Sharing Strategy-Searching And Search Engine Placement-Connecting With Others.				
UNIT IV		WIDGETS AND BADGES		12 Hours
Widgets and Badges: Highlighting Social Web Presence-Sharing And Syndicating Content Making Site More Interactive-Promoting Products And Making Money-Using Widgets In Word Press-Widget Communities And Directories- Working Widgets Into Strategy Social Media Newsrooms-Building Social Media Newsroom - Populating The Newsroom-Social Media News Releases-Social Media Newsroom Examples. More Social Tools-Social Calendars-Social Pages Wikis-Social Search Portals-Virtual Worlds.				

UNIT V	WEBSITE OPTIMIZATION	12 Hours
Website optimization: A Website Optimization Plan-Streamlining Web Presence-An Integration Plan-Looking to the Future-Life streaming: The Future of Blogging-Distributed Social Networking-Social Ranking, Relevancy, and —Defriending-Web 3.0 or The Semantic Web-Mobile Technology-Measuring Your Success-A Qualitative Framework-A Quantitative Framework-Tools to Help You Measure-Come To Your Own Conclusions		
TEXT BOOK:		
1.	Deltina hay —A Survival Guide To social Media and Web 2.0 Optimization , Dalton Publishing, 2009	
REFERENCE BOOKS:		
1	Miriam Salpeter —Social Networking for Career Success Learning Express, 2011.	
2	Miles, Peggy, —Internet world guide to webcasting Wiley, 2008 Professionals”, Wiley Publication,2015.	
WEB REFERENCES:		
1	https://www.tutorialspoint.com/internet_technologies/social_networking.htm	
2	https://onlinecourses.nptel.ac.in/noc23_cs106/preview	
3	https://www.thatcompany.com/6-social-media-platforms	

Course code	23PCSS41	BLOCKCHAIN TECHNOLOGY	HOURS	CREDITS
Core/Elective		Elective	4	2
COURSE OUTCOMES:				
On the successful completion of the course, student will be able to:				
CO 1	Demonstrate block chain technology and crypto currency			K1,K2
CO 2	Understand the mining mechanism in blockchain			K2
CO 3	Apply and identify security measures, and various types of services that allow people to trade and transact with bitcoins			K3,K4
CO 4	Apply and analyze Blockchain in health care industry			K4,K5
CO 5	Analyze security, privacy, and efficiency of a given Blockchain system			K5,K6
CO 6	Analyze problems and challenges posed by Blockchain.			K5,K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create				
UNIT I	INTRODUCTION			12 Hours
Introduction to Blockchain - The big picture of the industry – size, growth, structure, players. Bitcoin versus Cryptocurrencies versus Blockchain - Distributed Ledger Technology (DLT). Strategic analysis of the space – Blockchain platforms, regulators, application providers. The major application: currency, identity, chain of custody.				
UNIT II	NETWORK AND SECURITY			12 Hours
Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Blockchain 1.0, 2.0 and 3.0 – transition, advancements and features. Privacy, Security issues in Blockchain.				
UNIT III	CRYPTOCURRENCY			12 Hours
Cryptocurrency - History, Distributed Ledger, Bitcoin protocols -Symmetric-key cryptography - Public-key cryptography - Digital Signatures -High and Low trust societies - Types of Trust model: Peer-to-Peer, Leviathan, and Intermediary. Application of Cryptography to Blockchain				
UNIT IV	CRYPTOCURRENCY REGULATION			12 Hours
Cryptocurrency Regulation-Stakeholders, Roots of Bitcoin, Legal views-exchange of cryptocurrency - Black Market - Global Economy. Cyrtoeconomics – assets, supply and demand, inflation and deflation – Regulation.				
UNIT V	CHALLENGES IN BLOCKCHAIN			12 Hours
Opportunities and challenges in Block Chain – Application of block chain: Industry 4.0 – machine to machine communication –Datamanagementinindustry4.0–future prospects. Block chain in Health 4.0 - Blockchain properties - Healthcare Costs - Healthcare Quality - Healthcare Value - Challenges for using blockchain for healthcare data				
TEXT BOOKS:				
1	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive			

	Introduction”, Princeton University Press (July 19, 2016).
2	Antonopoulos, “Mastering Bitcoin:Unlocking Digital Cryptocurrencies”
REFERENCE BOOKS:	
1	Satoshi Nakamoto, “Bitcoin: A Peer-to-Peer Electronic Cash System”
2	Rodrigoda Rosa Righi, Antonio Marcos Alberti, Madhusudan Singh, “Blockchain Technology for Industry 4.0” Springer 2020.
WEB REFERENCES:	
1	https://www.javatpoint.com/blockchain-tutorial
2	https://www.tutorialspoint.com/blockchain/index.htm
3	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/

EXTRA CREDIT COURSE [ECC]

WEB DESIGNING WITH BOOTSTRAP AND JQUERY (Course code: 23PCSEC1)

SEMESTER - I	ECC-1	CREDITS - 2
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COURSE OUTCOMES:

Upon completion of the course the student will be able to

- CO 1: Define Bootstrap Environment (K1)
- CO 2: Describe the usage of Bootstrap Layout Components (K2)
- CO 3: Use Bootstrap Layout Components (K3)
- CO 4: Apply Bootstrap Navigation Elements (K3)
- CO 5: Illustrate the usage of jQuery(K4)
- CO 6: Summarize the concept of JSON (K5)

UNIT I:

Bootstrap: Introduction – Overview – Environment Setup – Bootstrap With CSS: Grid System – CSS – Typography – Tables - Forms – Buttons – Images – Helper Classes – Responsive Utilities

UNIT II:

Bootstrap Layout Components: Glyphicons – Dropdowns – Button Groups – Button Dropdown – Input groups – Breadcrumb - Clearfix – Star Rating – Tooltip - Picker

UNIT III:

Bootstrap: Navbar – Navigation Elements – Pagination – Labels – Badges – Jumbotron – Page Header – Thumbnails – Alerts – Progress Bars – Media Object – List Group – Panels – Wells – Carousel - Tabs/Pills – Modals – Popover – Scrollspy

UNIT IV:

Jquery: Introduction – Overview – Basics – Selectors – Effects – hide – show – toggle – slideToggle – animate – delay – text() – val – css – before – prepend – append – after – insertAfter – remove – clone – empty – attr - wrapall – unwrap – serialize – serialize Array – Jquery Events

UNIT V:

JSON : Introduction - Basic Example - Object - Array - Comments - Parse JSON Data - XML: Introduction - Features - Basic Example - Attributes - Comments - Validation - DTD - XML Parsers

TEXT BOOK:

1. Paul Deital, Harvey Deitel& Abbey Deitel,, "Internet and World Wide Web - How to Program", Pearson, Fifth Edition, 2012

REFERENCE BOOK:

1. Matt Lambert, "Learning Bootstrap 4", Packt Publishing, Second Edition, 2016

WEB REFERENCES:

1. <https://www.udemy.com/course/web-design-from-scratch-html-css-js-jquery-bootstrap>
2. <https://www.myhsts.org/tutorial-build-a-simple-dynamic-website-using-bootstrap-4-and-jquery.php>
3. <https://www.upwork.com/services/product/design-a-website-design-using-html-css-bootstrap-and-jquery-1331414924869218304>

EXTRA CREDIT COURSE [ECC]

PC ASSEMBLING AND TROUBLE SHOOTING
(Course code: 23PCSEC2)

SEMESTER - II

ECC-2

CREDITS - 2

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

CO 1: Recognize basics of hardware components and its characteristics (K1)

CO 2: Understand about different processors (K2)

CO 3: Learn about installation, configuration and upgrading software (K3)

CO 4: Learn to trouble shoot in the microcomputer (K4)

CO 5: Evaluate Trouble shooting Techniques(K5)

CO 6: Create Troubleshooting techniques based on the problems(K6)

UNIT I:

Assemble and setup and upgrade personal computer systems : Identify modules that make up a computer system and its operation - Understand that a computer requires both hardware and software to work - Describe the different hardware components inside of and connected to a computer.

UNIT II:

Identify each type of computer bus structure - Learn about the many different processors – processor history – processors used for personal computers and notebook computers.

UNIT III:

Perform installation, configuration, and upgrading of microcomputer hardware and Software : Assemble/setup microcomputer systems, accessory boards - Learn about the different types of motherboards and how to select one - Install or replace a motherboard - Troubleshoot problems with memory.

UNIT IV:

Install/connect associated peripherals: Learn how printers and scanners work- Install printers and scanners and how to share a printer over a local area network - Troubleshoot printer and scanner problems - Solve hard drive problems –

UNIT V:

Diagnose and troubleshoot microcomputer systems hardware and software, and other peripheral equipment: Understand how to approach and solve a PC problem - Troubleshoot a failed boot before the OS is loaded - Describe the general approaches you need to take when installing and supporting I/O devices - diagnose and isolate faulty components.

TEXT BOOK:

1. A+ Guide to Hardware: Managing, Maintaining, and Troubleshooting, “Jean Andrews”, Fourth Edition, 2016.

REFERENCE BOOK:

1. Stephen Bigelow ,Troubleshooting, Maintaining & Repairing PCs, McGraw Hill Education India2017

WEB REFERENCES:

1. <https://sbs.ac.in/course/pc-assembly-troubleshootingugca1919>
2. <https://www.planeteducate.com/computer-assembling-and-troubleshooting-112-a>
3. <https://www.digitaltrends.com/computing/pc-troubleshooting-guide/>

**EXTRA CREDIT COURSE [ECC]
GREEN COMPUTING
(Course code: 23PCSEC3)**

SEMESTER - III	ECC-3	CREDITS - 2
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COURSE OUTCOME:

Upon completion of the course the student will be able to

CO 1: Describe about reducing the usage of hazardous materials (K1)

CO 2: Discuss Deep Green Computing (K2)

CO 3: Describe about reducing Greenhouse Gas Emissions (K3)

CO 4: Examine energy efficiency during the product's lifetime (K3)

CO 5: Select go green technique to overcome climate change (K5)

CO 6: Create a platform which supports Green Computing (K6)

UNIT I:

Green Computing and Saving Money: Key Concepts – Getting Focused on Money- Saving Efforts – Implementing Energy Efficiency – Changing How Current Devices Are Used – Moving to Cloud Services – Digitizing Non-IT Functions – Greening Your Energy-Saving Moves – Some Big Thinking About Money- Saving Efforts. Green Computing and the Environment: Key Concepts – Environmental Drivers for Green Computing – Green Agenda– Key Roots of Environmentalism – Environmentalism and IT – The New Imperative of Climate Change – A Brief History of the Climate and Climate Change – The 2°C Warming "Limit" – Climate Change and IT – Next with Climate Change – What It Means to "Go Green" .

UNIT II:

A New Vision of Computing: Key Concepts – Cloud Computing Emerges – The End of the PC Era – Some New- Model IT – Challenges – A Few Examples from a Multinational – How a Company Adopted the iPhone – A Mental Model for IT Simplicity – Why Green Computing Fits the New Model – Disadvantages of Cloud Computing – Managing Disadvantages of Cloud Computing – What to Do Besides Cloud Computing – Efficiency and Cloud Computing – Greenability and Cloud Computing – Responsibility, Usability, and Cloud Computing – The Philosophical Implications of Green Computing – The Zen of Green Computing. Building a Green Device Portfolio : Key Concepts – Introduction .

UNIT III:

Green Servers and Data Centers: Key Concepts – Choosing and Creating Green Data Centers – Green Data Centers as a Model – The Last Shall Be First – Data Center Green – Building and Power Supply Considerations – Servers, Storage, and Networking – Data Center Suppliers Saving Energy: Key Concepts – Saving Energy Serves Many Masters – Cost Savings through Energy Savings – Risk Reduction through Energy Savings – Carbon Footprint Reduction through Energy Savings – Improving Your Reputation and Brand – Why

Energy Prices Will Stay High –Embodied Energy – Analyzing Your Energy Usage – A Recipe for Energy Savings – Understanding the Unique Energy Needs of IT – Focusing on Solar Power – Saving Energy and the Supply Chain – Energy-Saving Pilot Projects – Selling Energy Savings

UNIT IV:

Reducing Greenhouse Gas Emissions: Key Concepts – Why Greenhouse Gas Emissions Are Important – Sources and Sinks of Greenhouse Gases and Warming –Reducing Emissions I: Embodied Energy – Reducing Emissions II: Daily Energy Use – Reducing Emissions III: Taking Steps to Use Different Sources – Reducing Emissions IV: Supply Chain Success.

Reducing Resource Use: Key Concepts – Resource Use Is Important – A Resource Use Checklist – Planned Obsolescence and Resource Use – The Story of Apple and EPEAT – Case Study: Computer Hardware and RSI.

UNIT V:

Green Computing by Industry Segment: Key Concepts – Evaluating Greenness – The Newsweek – Green 500 Approach – Looking at Industry Segments – Analyzing Your Own Initiatives, Company, and Sector. The Future: Deep Green Computing: Key Concepts – Green Computing and the Future – Megatrends for Green Computing – An Increasing Need for Sustainability – The Continually Decreasing Cost of Core Computing Capabilities – The Ability of Computing to Do More and More Telepresence Instead of Travel – Telecommuting Instead of Commuting – Toward Deep Green Computing – Platforms for Deep Green Computing – Selling Deep Green Computing.

TEXT BOOK:

1. Bud E. Smith, Green Computing Tools and Techniques for Saving Energy, Money and Resources, CRC Press, 2014.

REFERENCE BOOKS:

1. Toby Velte, Anthony Velte, Robert Elsenpeter, Green IT, McGraw Hill, 2008.
2. Alvin Galea, Michael Schaefer, Mike Ebbers, Green Data Center: Steps for the Journey, Shroff Publishers and Distributors, 2011.

WEB REFERENCES:

1. <https://blogs.nvidia.com/blog/2022/10/12/what-is-green-computing>
2. <https://www.techtargget.com/searchdatacenter/definition/green-computing>
3. <https://www.techopedia.com/definition/14753/green-computing>

EXTRA CREDIT COURSE [ECC]

WIRELESS TECHNOLOGY (Course code: 23PCSEC4)

SEMESTER - IV

ECC-4

CREDITS - 2

COURSE OUTCOMES:

Upon completion of the course the student will be able to

- CO 1: Describe the overview of Wireless Networks (K2)
- CO 2: Describe the fundamental concepts of transmission techniques (K2)
- CO 3: Demonstrate the principles of wireless networks (K3)
- CO 4: Illustrate the concept of GSM, TDMA, CDMA and various technologies(K4)
- CO 5: Illustrate and evaluate the concept of ADHOC network & Bluetooth(K5)
- CO 6: Create and customize mobile application protocols.(K6)

UNIT I:

Overview of wireless Networks: Introduction, different generation of wireless networks, characteristics of wireless medium: Introduction- Radio propagation mechanism - path- loss modeling and signal coverage effects of multipath and Doppler - channel measurement & modeling techniques- simulation of the radio channel.

UNIT II:

Physical layer alternatives for wireless networks: Networks - applied wireless transmission techniques-short distance baseband transmission - UWB pulse transmission - Carrier modulated transmission - traditional digital cellular transmission - broadband modems for higher speeds - spread spectrum transmission -high speed modems for spread spectrum transmission - diversity and smart receiving techniques.

UNIT III:

Principles of wireless networks: Network planning: Introduction - wireless network topologies - cellular topology -cell fundamentals - signal to interference calculation - capacity expansion techniques - network planning for CDMA systems -wireless network operations: Introduction - mobility management – radio resources and power management - security in wireless networks.

UNIT IV:

GSM and TDMA technology: Introduction – GSM - Mechanisms to support a mobile environment - communication in the infrastructure. CDMA technology -IS – 95 and IMT – 2000 – introduction - reference architecture for North American systems – CDMA - IMT – 2000. Mobile data networks: Introduction - the data oriented CDPD networks - GPRS and higher data rates - short messaging service in GSM - Mobile application protocols.

UNIT V:

Local BROADBAND and AD HOC networks: Introduction to wireless LAN: Introduction - evolution of the WLAN industry - IEEE 802.11 WLANS: Introduction- IEEE 802.11 - The PHY LAYER - MAC Sublayer - MAC management sublayer - Wireless ATM – HIPERLAN - HIPERLAN-2 - Ad Hoc networking and WPAN - wireless ATM and HIPERLAN - IEEE 802.15 WPAN - Home RF - Bluetooth - wireless geolocation systems: wireless geolocation -wireless geolocation system architecture.

TEXT BOOK:

1. Kaveh Pahlavan and Prashant Krishnamurthy, “Principles of wireless Networks”, Pearson education, 2004.

REFERENCE BOOKS:

1. William Stallings, “Wireless Communications and Networks”, Second Edition, PHI, 2008
2. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2009

WEB REFERENCES:

1. <https://www.encyclopedia.com/computing/news-wires-white-papers-and-books/wireless-technology>
2. <https://www.techtarget.com/searchmobilecomputing/definition/wireless>
3. <https://connectedplatforms.com.au/types-of-wireless-technologies>

VALUE ADDED COURSE

DIGITAL FORENSICS (Course code: 23PCSV A1)

COURSE OUTCOMES:

- CO 1: Understand the origin of forensic science (K2)
- CO 2: Understand the difference between scientific conclusions and legal decision-making (K2)
- CO 3: Evaluate the Computer Investigations (K5)
- CO 4: Validate data acquisitions (K5)
- CO 5: Practice in digital forensic Tools. (K6)
- CO 6: Create a model Forensic Tool based on available Tools(K6)

UNIT I:

Introduction to Digital Forensics, Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, introduction to internet crimes, hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimes and modules.

UNIT II:

Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications.

UNIT III:

Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information, process of computer forensics and digital investigations,

UNIT IV:

Processing of digital evidence, digital images, damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.

UNIT V:

Evaluating Digital Forensics Tool Needs-Types -Tasks Performed-Tool Comparisons-Digital Forensics Software Tools-Command-Line Forensics Tools-Digital Forensics Hardware

Tools-Forensic Workstations-Validating and Testing Forensics Software-Using National Institute of Standards and Technology Tools.

TEXT BOOKS:

1. C. Altheide & H. Carvey Digital Forensics with Open Source Tools, Syngress, 2018.
2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning, 2019.

REFERENCE BOOKS:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2015, ISBN: 1-58450-389.
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2016, ISBN: 0-619-21706-5.

WEB REFERENCES:

1. <https://www.interpol.int/en/How-we-work/Innovation/Digital-forensics>
2. <https://www.eccouncil.org/cybersecurity/what-is-digital-forensics>
3. <https://www.geeksforgeeks.org/digital-forensics-in-information-security>

VALUE ADDED COURSE

DATA VISUALIZATION (Course code: 23PCSVA2)

Course Outcomes:

By the end of this course, the learners will be able to

- CO 1: Use python libraries for data visualization (K1)
- CO 2: Conduct exploratory data analysis using Python (K2)
- CO 3: Interpret results of exploratory data analysis (K3)
- CO 4: Paraphrase the results for documentation (K4)
- CO 5: Apply and evaluate Dash Board & Visual Perception and Cognition (K5)
- CO 6: Create Visualization Designs. (K6)

UNIT I:

Basic Plotting-Line plot - Bar plot - Pie Chart - Scatter Plot - Histogram - Stacked Bar Charts
- Sub Plots - Matplotlib, Seaborn, Plotly - Seaborn Styles

UNIT II:

Applied Visualizations-Box plot - Density Plot - Area Chart - Heat map - Tree map - Graph Networks

UNIT III:

Interactive Visualizations and Animations - dynamic charts - Dynamic maps - Animation types - 2D, 3D, Motion Animation - Animation Principles - Altair Package - Statistical Visualizations

UNIT IV:

Principles of Information Visualization-Visual Perception and Cognition - Gestalt's Principles

UNIT V:

Tufte's Principles - Applications of Principles of Information Visualization - Dashboard Design.

TEXT BOOK:

1. Andy Kirk, Data Visualization: A Handbook for Data Driven Design, SAGE Publications Ltd; First Edition, 2016

REFERENCE BOOK:

1. Alex Campbell, Data Visualization-Proper Guide for Data Scientist, 2016, B08JHGFHM1

WEB REFERENCES:

1. <https://www.tableau.com/learn/articles/data-visualization>
2. <https://www.techtarget.com/searchbusinessanalytics/definition/data-visualization>
3. <https://www.javatpoint.com/what-is-data-visualization>

VALUE ADDED COURSE

CROSS PLATFORM APPLICATION DEVELOPMENT USING REACT NATIVE (Course code: 23PCSVA3)

Course Outcomes:

By the end of this course, the learners will be able to

CO 1: Understand React Native Objectives (K1)

CO 2: Understand React Native Life Cycle (K2)

CO 3: Interpret the usage of cross platform application development (K3)

CO 4: Using appropriate APIs for applications (K4)

CO 5: Create applications for various domains (K6)

UNIT I:

Getting started with React Native - Introducing React and React Native - Understanding how React Native works - React Native's strengths - React Native's drawbacks - Creating and using basic components - Understanding React: Managing component data using state - Managing component data using props

UNIT II:

React component specifications - React lifecycle methods - Building first React Native app - Laying out the todo app - Coding the todo app - Opening the developer menu -Continuing building the todo app.

UNIT II:

Developing applications in React Native: Introduction to styling - Applying and organizing styles in React Native - Styling view components - Styling Text components - Styling in depth - Platform-specific sizes and styles - Using transformations to move, rotate, scale, and skew components - Using flexbox to lay out components.

UNIT IV:

Implementing cross - platform APIs - Using the Alert API to create cross-platform notifications - Using the App State API to detect the current application state - Using the Async Storage API to persist data - Using the Clipboard API to copy text into the user's clipboard –

UNIT V:

Using the Dimensions API to get the user's screen information - Using the Geo location API to get the user's current location information - Using the Keyboard API to control the location and functionality of the native keyboard - Using Net Info to get the user's current

online/offline status - Getting information about touch and gesture events with Pan Responder.

PRACTICAL LIST

1. Layout with Flexbox
2. Breaking down a UI into Components
3. Dealing with the Keyboard
4. Listing Data with the FlatList
5. Persistent Storage
6. Dealing with Remote Images on Slow Networks
7. Playing with Animations
8. Making a Declarative API for an Imperative API
9. API Calling Using GET & POST method

Text Book:

1. Nader Dabit, "React Native in Action", Manning Publications Co., 2019.

Reference Books:

1. Bonnie Eisenman, "Learning React Native - Building Native Mobile Apps with JavaScript", Second Edition, O'Reilly Media, Inc., 2018.
2. Jonathan Lebensold, "React Native Cookbook", O'Reilly Media, Inc., 2018.

Web References:

1. <https://www.netguru.com/glossary/react-native>
2. <https://www.oreilly.com/library/view/learning-react-/9781491929049/ch01.html>
3. https://www.tutorialspoint.com/react_native/index.htm