ST. MARY'S COLLEGE (Autonomous)

(Re-accredited with 'A$^+$' Grade by NAAC)

Thoothukudi-628001, Tamil Nadu

(**Affiliated to Manonmaniam Sundaranar University**)

Syllabus

M.Sc. Computer Science

School of Computing Sciences

Outcome Based Curriculum

(w.e.f. 2024)

Preamble

M.Sc. Computer Science program helps students to master their computer skills in programming and in managing databases and networks. The students are made globally competent and innovative.

Vision

To empower young women to be technologically adept and encourage them to build their careers in the innovative field of computing

Mission

- To provide learning ambience with professional training to create and apply knowledge of computer science in various fields.
- To impart necessary skills to develop innovative products and moral values to find solution to real life problems.

Programme Outcome

PO No.	**After completion of the Postgraduate programme the students of St. Mary's College will be able to**
PO 1	acquire expertise knowledge in their respective disciplines and become professionals.
PO 2	develop critical/logical thinking skills, managerial skills and become locally, nationally & globally competent and be a lifelong learner
PO 3	pursue research / higher learning programme & apply their experiment and research skills to analyze and solve complex problems.
PO 4	compete in the job market by applying the knowledge acquired in Arts, Science, Economics, Commerce and Management studies
PO 5	be an empowered and economically independent woman with efficient leadership qualities and develop the themselves as a holistic person

Program Specific Outcome:

PSO. No.	Students of M.Sc. Computer Science will be able to	PO addressed
PSO-1	prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions	**PO-4**
PSO-2	create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate start up and high potential organizations.	**PO-5,PO-2**
PSO-3	design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.	**PO-3**
PSO-4	produce employable, ethical and innovative professionals to sustain in the dynamic business world.	**PO-1**
PSO-5	contribute to the development of the society by collaborating with stakeholders for mutual benefit.	**PO-5**

Course Structure (w.e.f. 2024)

Semester – I

Course	Course Code	Course Title	Hours / Week	Credits	Max Marks		
					CIA	ESE	Total
Core I	24PCSC11	Analysis and Design of Algorithms	5	4	40	60	100
Core II	24PCSC12	Web Development in Python	5	4	40	60	100
Core III	24PCSC13	Mathematical Foundation for Computer Science	5	4	40	60	100
Core Practical I	24PCSCR1	Analysis and Design of Algorithms Lab	4	2	40	60	100
Core Practical II	24PCSCR2	Web Development in Python Lab	3	2	40	60	100
Discipline Specific Elective I	24PCSE11/ 24PCSE12	**A. Soft Computing** B. Multimedia and its Applications	4	3	40	60	100
Skill Enhancement Course	24PCSSE1	React JS	4	3	40	60	100
MOOC (Compulsory)				+2			
		Total	**30**	**22+2**			

Semester – II

Course	Course Code	Course Title	Hours / Week	Credits	Max Marks		
					CIA	ESE	Total
Core IV	24PCSC21	Compiler Design	5	4	40	60	100
Core V	24PCSC22	Network Programming using Java	5	4	40	60	100
Core VI	24PCSC23	Digital Image Processing	5	4	40	60	100
Core Practical III	24PCSCR3	Digital Image Processing Lab	4	2	40	60	100
Core Practical IV	24PCSCR4	Java Programming Lab	3	2	40	60	100
Discipline Specific Elective II	24PCSE21/ 24PCSE22	**A. Blockchain Technology** B. Theory of Computation	4	3	40	60	100
Skill Enhancement Course	24PCSSE2	Soft Skills	4	3	40	60	100
		Total	**30**	**22**			

Semester – III

Course	Course Code	Course Title	Hours / Week	Credits	Max Marks		
					CIA	ESE	Total
Core VII	24PCSC31	Data Mining and Data Warehousing	5	5	40	60	100
Core VIII	24PCSC32	Network Security and Cryptography	5	4	40	60	100
Core IX	24PCSC33	Research Methodology	5	4	40	60	100
Core Practical V	24PCSCR5	Data Mining and R Lab	4	2	40	60	100
Core Practical VI	24PCSCR6	Network Security And Cryptography Lab	3	2	40	60	100
Discipline Specific Elective III	24PCSE31/ 24PCSE32	**A. Artificial Intelligence and Machine Learning** B. Embedded Systems	4	3	40	60	100
Skill Enhancement Course	24PCSSE3	Web Designing using PHP Lab	4	3	40	60	100
Internship / Self Study (Optional)	24PCSI31/ 24PCSSS1	Course for Competitive Exams		+2			
		Total	**30**	**23+2**			

Semester – IV

Course	Course Code	Course Title	Hours / Week	Credits	Max Marks		
					CIA	ESE	Total
Core X	24PCSC41	Data Science and Analytics	5	5	40	60	100
Core XI	24PCSC42	Internet of Things	5	5	40	60	100
Core Practical VII	24PCSCR7	IoT with Simulation & Arduino Lab	4	2	40	60	100
Core Practical VIII	24PCSCR8	Data Science Lab	4	2	40	60	100
Core	24PCSP41	Project	12	9	40	60	100
		Total	**30**	**23**			

Note: 1. It is mandatory for all I PG students to attend the course through Swayam Portal. Students who pass in MOOC through portals will get extra credit. Students who fail in MOOC can appear for supplementary exam and the institution will provide the certificate. No extra credits will be given.

2. Internship can be completed during the II Semester vacation.

Master of Science (Computer Science)

Components	No. of Courses	No. of. Hours	Total Credits	Extra Credits
Core	11	55	47	
Practical	8	29	16	
Elective	3	12	9	
Skill Enhancement	3	12	9	
Project	1	12	9	
MOOC	1			+2
Self-Study Course/MOOC/ Internship	1			+2
		120	**90**	**+4**

SEMESTER – I			
CORE I - ANALYSIS AND DESIGN OF ALGORITHMS			
Course Code : 24PCSC11	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 4**

Course Objectives:

1. Enable the students to learn the Elementary Data Structures and algorithms.
2. Presents an introduction to the algorithms, their analysis and design
3. Discuss various methods like Basic Traversal And Search Techniques, divide and conquer method, Dynamic programming, backtracking
4. Understood the various design and analysis of the algorithms.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	estimate the correctness of algorithms using loop invariance.	K1
CO-2	explain important algorithmic design paradigms and apply when algorithm design situation calls for it.	K2
CO-3	demonstrate the major graph algorithms and employ when appropriate.	K3
CO-4	compare between different data structures and pick up appropriate data structures for a design situation.	K4
CO-5	recommend the correct algorithm for problems.	K5

SEMESTER – I			
CORE I- ANALYSIS AND DESIGN OF ALGORITHMS			
Course Code : 24PCSC11	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 4**

UNIT: 1 FUNDAMENTALS

Introduction: - Algorithm Definition and Specification – Space complexity-Time Complexity- Asymptotic Notations - Elementary Data Structure: Stacks and Queues – Binary Tree - Binary Search Tree - Heap – Heap sort- Graph.

UNIT: 2 TRAVERSAL AND SEARCH TECHNIQUES

Basic Traversal And Search Techniques: Techniques for Binary Trees-Techniques for Graphs -Divide and Conquer: - General Method – Binary Search – Merge Sort – Quick Sort.

UNIT: 3 GREEDY METHOD

The Greedy Method:-General Method–Knapsack Problem–Minimum Cost Spanning Tree– Single Source Shortest Path.

UNIT: 4 DYNAMIC PROGRAMMING

Dynamic Programming-General Method–Multistage Graphs–All Pair Shortest Path–Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.

UNIT: 5 BACKTRACKING

Backtracking:-General Method–8-Queens Problem–Sum Of Subsets–Graph Coloring– Hamiltonian Cycles – Branch And Bound: - The Method – Traveling Salesperson.

Text Books

1. Ellis Horowitz. *Computer Algorithms* Galgotia Publications.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman. *Data Structures and Algorithms.*

Reference Books

1. Goodrich. *Data Structures & Algorithms in Java*. Wiley, 3rd edition.
2. Skiena. *The Algorithm Design Manual*. Springer, Second Edition, 2008.
3. Anany Levith. *Introduction to the Design and Analysis of algorithm.* Asia: Pearson Education, 2003.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

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 Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	3	2	3	2	3	3	2	2	2
CO-2	2	2	3	2	2	2	2	3	2	2
CO-3	3	2	2	2	2	2	2	2	3	2
CO-4	2	2	2	3	2	3	2	2	2	2
CO-5	2	2	3	2	2	2	2	3	2	2
Ave.	2.2	2.2	2.4	2.4	2	2.4	2.2	2.4	2.2	2

SEMESTER – I			
CORE II - WEB DEVELOPMENT IN PYTHON			
Course Code : 24PCSC12	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 4**

Course Objectives:

1. To learn how to design framework with django.
2. To work with forms and authentication with django
3. To implement database interaction using SQLite.
4. To deploy website using django.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	define database models in Django.	K1
CO-2	solve problems and their need.	K2
CO-3	construct web application more reliable, scalable, adaptable, and simple.	K3
CO-4	simplify work for programmers by using rapid development.	K4
CO-5	prove the skills and understanding necessary to develop web applications using Django.	K5

SEMESTER – I			
CORE II - WEB DEVELOPMENT IN PYTHON			
Course Code : 24PCSC12	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 4**

UNIT: 1 INTRODUCTION TO DJANGO FRAMEWORK

Django overview-Views and URL Confs-Templates-Models

UNIT: 2 Jinja Templates in Django

Jinga Advantages and Disadvantages-Transition to Jinja Template from Django Templates-New Concept and features in Jinja Templates-Jinja template Configuration in Django-Jinga Built-In statements/tags and Function-Jinja Built-In Filters and Tests.

UNIT: 3 Django Forms and Admin site

Django Form Structure and Workflow-Django Form Processing-Django Form field Types-Set Up the Layout for Django forms-Django Custom From Fields-Making a Contact form-Using the Admin site-Making fields optional-Custom model admin classes.

UNIT: 4 Django Model Queries and Managers

CRUD single records in Django models-CURD Multiple Records in Django Models-CRUD Relationship Records across Django models-Model Queries by SQL keyword.

UNIT: 5 Testing and Deploying Django

Introduction to automated testing-Testing tools-Choosing the host-Preparing the site for Deployment-Deploy to Python Anywhere.

Reference Books:

1. Nigel George. *Mastering Django: Core - The Complete guide to Django 1.8.* Packet Publishing Ltd., 2016.
2. Daniel Rubio F. Bahia, Ensenada, Baja California. *Beginning Django: Web Application Development and Deployment with Python*. Mexico press publication, 2017.
3. Leonardo Luis Lazzaro. *Ultimate Django for Web App Development Using Python: Build Modern, Reliable and Scalable Production-Grade Web Applications with Django and Python.* published by Orange Education Pvt Ltd. 2024.
4. Nigel George. *Build a website with Django.* GNW Independent Publishing. 1st Edition 2019.
5. Ray Yao," *Django in 8 Hours: For Beginners, Learn Coding Fast. Independently published Edition. 2nd Edition 2020.*
6. Andrew Pinkham. *Django Unleashed.* Pearson Education, Inc. 2016.

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	2	3	3	2	2	2	3	3	2	2
CO-3	2	2	2	3	3	3	2	2	2	3
CO-4	2	2	2	3	3	3	2	2	2	3
CO-5	2	3	3	3	2	3	3	3	2	2
Ave.	2.2	2.4	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4

SEMESTER – I			
CORE III - MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE			
Course Code : 24PCSC13	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 4**

Course Objectives:

1. To understand and apply the class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
2. Apply the concept of two dimensional random variables to correlation, regression and Central limit theorem
3. Analyze whether given graphs are isomorphic and apply different algorithms to find the shortest path.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	recall the fundamental concepts of logic, abstract algebra, linear algebra, probability and statistics, graph theory etc.	K1
CO-2	summarize mathematical principles and logic.	K2
CO-3	apply mathematical logic to solve problems.	K3
CO-4	analyze whether given graphs are isomorphic.	K4
CO-5	evaluate real-world problems using graphs and trees.	K5

SEMESTER – I			
CORE III - MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE			
Course Code : 24PCSC13	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 4**

UNIT: 1

Moments - Skewness and kurtosis-Curve Fitting-Method of least squares-fitting lines-parabolic, exponential & logarithmic curves

UNIT: 2

Correlation & regression - Karl Pearson's coefficient of correlation- lines of regression coefficient - rank correlation.

UNIT: 3

Mathematical Logic: Propositions and Predicate logic - Truth table – Propositional-Equivalence- Normal forms - Predicate and Quantifiers-Rules of Inference.

UNIT: 4

Graph Theory: Introduction – Paths and Circuits: Sub graphs – Walks, Paths, Circuits Connected Graphs, Disconnected Graphs and Components – Euler Graphs – Operations on Graph – Hamiltonian Paths and Circuits - Trees and Fundamental Circuits: Trees – Some properties of Trees – Distance and Centers in a Tree – Rooted and Binary Trees – Spanning Trees – Fundamental Circuits

UNIT: 5

Cut-Sets and Cut-Vertices: Cut-Sets – Properties of Cut-Sets – All Cut-Sets in a Graph – Fundamental Circuits and Cut-Sets – Connectivity and Separability – Planar Graphs: Combinational vs geometric graphs – Planar graphs – Different representation of a planar graph – Matrix: Incidence matrix, Submatrices, Circuit matrix.

Text Books:

1. Dr.M.K.Venkatraman, Dr. N. Sridharan and N.Chandrasekaran. *Discrete Mathematics*. Chennai: The National Publishing Company 2007.
2. S. Arumugam and A. Issac. *Statistics*. Palayamkottai: New Gamma publishing House 2011.
3. NarsinghDeo. *Graph Theory with Application to Engineering and Computer Science*. Prentice-Hall of India Pvt.Ltd 2003.

Reference Books:

1. Tremblay and Manohar. *Discrete Mathematical Structures with applications to Computer Science*. Tata McGraw Hill.
2. A.Tamilarasi and A.M.Natarajan. *Discrete Mathematics and its Application.* Khanna Publishers, 2nd Edition 2005.
3. Bondy, J. A. and Murty, U.S.R. *Graph Theory with Applications.* North Holland Publication 2008.

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	2	3	3	2	2	2	3	3	2	2
CO-3	2	3	3	3	2	3	3	3	2	2
CO-4	3	3	3	2	2	2	3	3	3	2
CO-5	2	2	2	3	3	3	2	2	2	3
Ave.	2.4	2.6	2.6	2.4	2.2	2.4	2.6	2.6	2.4	2.2

SEMESTER – I			
CORE PRACTICAL I - ANALYSIS AND DESIGN OF ALGORITHMS LAB			
Course Code : 24PCSCR1	**Hrs / Week : 4**	**Hrs / Sem : 60**	**Credits :2**

Course Objectives:

1. This course covers the basic data structures like Stack, Queue, Tree, List.
2. This course enables the students to learn the applications of the data structures using various techniques
3. It also enable the students to understand OOAD concepts and application of OOPS concepts.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	recall the concepts of object.	K1
CO-2	understand OOPS concepts.	K2
CO-3	implement data structures like Stack, Queue, Tree, List.	K3
CO-4	analyze OOPS .	K4
CO-5	evaluate data structures for Sorting, Searching using different techniques.	K5

LIST OF PROGRAMS

1) Perform various operations on stack using linked list
2) Perform various operations in circular queue
3) Traverse through binary search tree using traversals
4) Sorting
5) Prim's Algorithm
6) Knapsack problem using greedy method
7) Single Source Shortest Path
8) N-queen problem
9) Sum of Subsets
10) Travelling Salesman Problem

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	3	3	2	2	2	2	3	2	3	2
CO-3	2	3	3	3	2	3	3	3	2	2
CO-4	2	2	3	3	2	3	2	3	2	2
CO-5	2	3	3	3	2	3	3	3	2	2
Ave.	2.4	2.6	2.6	2.6	2	2.6	2.6	2.6	2.4	2

SEMESTER – I			
CORE PRACTICAL II - WEB DEVELOPMENT IN PYTHON - LAB			
Course Code : 24PCSCR2	**Hrs / Week :3**	**Hrs / Sem :45**	**Credits :2**

Course Objectives:

1. To learn how to design framework with django.
2. To work with forms and authentication with django
3. To implement database interaction using SQLite.
4. To deploy website using django.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	define Database Models in Django.	K1
CO-2	solve problems and their need.	K2
CO-3	construct web application more reliable, scalable, adaptable, and simple.	K3
CO-4	simplify work for programmers by using rapid development.	K4
CO-5	prove the skills and understanding necessary to develop web applications using Django.	K5

LIST OF PROGRAMS

1. Create a function -based view and apply URL mapping.
2. Create a class-based view in Django.
3. Page Redirection in Django.
4. Sending E-mail.
5. Form Processing
6. Create a Django model and perform CURD operation
7. Cookie Handling
8. Session Handling

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	2	2	3	2	2	2	2	3	2	2
CO-3	2	3	3	3	2	3	3	3	2	2
CO-4	2	2	2	3	3	3	2	2	2	3
CO-5	2	3	3	3	3	3	3	3	2	3
Ave.	2.2	2.4	2.6	2.6	2.4	2.6	2.4	2.6	2.2	2.4

SEMESTER – I			
ELECTIVE I A - SOFT COMPUTING			
Course Code : 24PCSE11	**Hrs / Week : 4**	**Hrs / Sem : 60**	**Credits : 3**

Course Objectives:

1. To solve real-world problems by providing approximate results that conventional and analytical models cannot solve.
2. To understand the features, advantages and applications of Artificial Intelligence.
3. To realize the revolution of artificial intelligence to develop hybrid systems for the industrial problems.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	define the fuzzy systems.	K1
CO-2	understand soft computing techniques and their role in problem solving.	K2
CO-3	identify the roles of neural network, fuzzy logic and genetic algorithms to build intelligent machines.	K3
CO-4	analyze and integrate various soft computing techniques in order to solve problems effectively and efficiently.	K4
CO-5	evaluate and compare solutions by various soft computing approaches for a given problem.	K6

SEMESTER – I			
ELECTIVE I A - SOFT COMPUTING			
Course Code : 24PCSE11	**Hrs / Week : 4**	**Hrs / Sem : 60**	**Credits : 3**

UNIT: 1 NEURAL NETWORKS FUNDAMENTALS

Fundamentals of ANN: The Biological Neural Network, Artificial Neural Networks - Building Blocks of ANN and ANN terminologies: Architecture, setting of weights, activation functions-McCulloch-pitts neuron model-Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules – Hebbian Learning rule- Perceptron learning rule-Delta Learning Rule.

UNIT: 2 CATEGORIES OF NEURAL NETWORKS

Models of ANN: Single layer perceptron- Architecture, Algorithm, application procedure. Feedback Networks: Hopfield Net and BAM - Feed Forward Networks: Backpropagation Network (BPN) and Radial Basis Function Network (RBFN) - Self Organizing Feature Maps: SOM and LVQ.

UNIT: 3 BASIC CONCEPTS OF FUZZY SET

Fuzzy Sets, properties and operations - Fuzzy relations, cardinality, operations and properties of fuzzy relations, fuzzy composition

UNIT: 4 MEMBERSHIP FUNCTION & FIS

Fuzzy variables - Types of membership functions - fuzzy rules: Takagi and Mamdani - fuzzy inference systems: fuzzification, inference, rule base, defuzzification.

UNIT: 5 GENETIC ALGORITHMS

Genetic Algorithm (GA): Biological terminology – elements of GA: encoding, types of selection, types of crossover, mutation, reinsertion – a simple genetic algorithm –General Genetic algorithm -The Schema Theorem - Classification of Genetic Algorithm - Applications of Genetic Algorithm.

Text Books:

1. S. N. Sivanandam, S. Sumathi and S.N. Deepa. *Introduction to Neural Networks using MATLAB 6.0*. New Delhi: Tata McGraw-Hill 2006.

2. S. N. Sivanandam and S.N. Deepa. *Principles of Soft Computing.* India: Wiley 2008.

Reference Books:

1. Simon Haykin. *Neural networks A Comprehensive Foundation*. Pearson Prentice Hall 2005
2. S.Rajasekaran and G.A.V.Pai. *Neural Networks, Fuzzy Logic and Genetic Algorithms.* PHI 2004.
3. S.N.Sivanandam and S.N.Deepa. *Introduction to Genetic Algorithms.* Springer 2007.
4. Timothy J.Ross. *Fuzzy Logic with Engineering Application.* McGraw Hill 2000.

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	2	3	3	3	2	3	3	3	2	2
CO-3	2	3	3	3	2	3	3	3	2	2
CO-4	2	3	3	3	3	3	3	3	2	3
CO-5	2	3	3	3	3	3	3	3	2	3
Ave.	2.2	2.8	2.8	2.8	2.4	2.8	2.8	2.8	2.2	2.4

SEMESTER – I			
ELECTIVE I B - MULTIMEDIA AND ITS APPLICATIONS			
Course Code : 24PCSE12	**Hrs / Week : 4**	**Hrs / Sem : 60**	**Credits : 3**

Course Objectives:

1. Understand the fundamentals of multimedia and its components.
2. Learn multimedia and design principles and authoring tools.
3. Develop skills in creating and editing multimedia content.
4. Apply multimedia concepts to real world projects.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	recognize the various file formats used in multimedia.	K1
CO-2	understand the technologies behind multimedia applications.	K2
CO-3	apply multimedia design principles to create engaging and effective content.	K3
CO-4	analyze the concepts of sound, images, video and animation.	K4
CO-5	assess the impact and effectiveness of multimedia content in various context.	K5

SEMESTER – I			
ELECTIVE I B - MULTIMEDIA AND ITS APPLICATIONS			
Course Code : 24PCSE12	**Hrs / Week : 4**	**Hrs / Sem : 60**	**Credits : 3**

UNIT: 1 INTRODUCTION

Definition - Classification - Multimedia application -Multimedia Hardware - Multimedia software - CDROM - DVD.

UNIT: 2 MULTIMEDIA AUDIO

Multimedia Audio: Digital medium - Digital audio technology - sound cards - recording - editing - MP3 - MIDI fundamentals - Working with MIDI - audio file formats - adding sound to Multimedia project.

UNIT: 3 MULTIMEDIA TEXT

Multimedia Text: Text in Multimedia -Multimedia graphics: coloring - digital imaging fundamentals - development and editing - file formats - scanning and digital photography

UNIT: 4 MULTIMEDIA ANIMATION

Multimedia Animation: Computer animation fundamentals - Kinematics - morphing - animation s/w tools and techniques. Multimedia Video: How video works - broadcast video standards - digital video fundamentals – digital video production and editing techniques - file formats.

UNIT: 5 MULTIMEDIA PROJECTS

Multimedia Project: stages of project - Multimedia skills - design concept - authoring - planning and costing –Multimedia Team. Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing

Text Books

1. S.Gokul. *Multimedia Magic*. BPB Publications, 2nd Edition.
2. Tay Vaughen. *Multimedia Making it Work*. TMH, 6th Edition.

Reference Books

1. Jiran Thakrar, Prabhat.k.and leigh. *Multimedia System Design*. Prentice Hall India.
2. Malay k Pakhira. *Computer graphics, Multimedia and Animation*. Prentice Hall India, 2nd Edition.

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO -1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	3	2	2	2	2	2	2	2	3	2
CO-3	2	3	3	3	2	3	3	3	2	2
CO-4	2	3	3	3	3	3	3	3	2	3
CO-5	2	3	3	3	3	3	3	3	2	3
Ave.	2.4	2.6	2.6	2.6	2.4	2.6	2.6	2.6	2.4	2.4

SEMESTER – I			
SKILL ENHANCEMENT COURSE - REACT JS			
Course Code : 24PCSSE1	**Hrs / Week : 4**	**Hrs / Sem : 60**	**Credits : 3**

Course Objectives:

1. Understand the new JavaScript language features, including classes, modules, and array functions.
2. Explore the basic architecture of a React application.
3. Gain a deep understanding of JSX and the Virtual DOM.
4. Use React components to build interactive interfaces.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	recognize the basic components of React JS.	K1
CO-2	understand the challenges in web development and how React addresses them, preparing for future advancements in React's ecosystem.	K2
CO-3	develop dynamic user interfaces using React JS with reusable components.	K3
CO-4	analyze and write unit testing for React components.	K4
CO-5	create dynamic and interactive web application.	K6

SEMESTER – I			
SKILL ENHANCEMENT COURSE- REACT JS			
Course Code : 24PCSSE1	**Hrs / Week : 4**	**Hrs / Sem : 60**	**Credits : 3**

UNIT: 1 JAVA SCRIPT FOR REACT

Declaring Variables-Creating Functions-Compiling JavaScript - Objects and Arrays Asynchronous JavaScript-Classes.

UNIT: 2 FUNCTIONAL PROGRAMMING WITH JAVASCRIPT

Functional Programming with JavaScript: Functional Concepts-Page Setup-React Elements-React DOM-React Components.

UNIT: 3 REACT WITH JS

React with JSX: React Elements as JSX - Babel - Recipes as JSX- React Fragments - Intro to web pack.

UNIT: 4 REACT STATE MANAGEMENT

Building a star Rating component – State in Component Trees – Building Forms – React Context.

UNIT: 5 INCORPORATING DATA

Requesting Data – Render Drops – Virtualized Lists-Introducing GraphQL.

Text Book:

1. Alex Banks and Eve Porcello. *Learning React Modern Patterns for Developing React Apps.* O'Reilly Media, Inc.,Second Edition.

Reference Books:

1. Robin Weiruch. *The Road to React.*
2. Zac Gordon. *React Explained. 2020 edition.*

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	2	2	3	3	3	3	3	3	2	3
CO-3	2	3	3	3	3	3	3	3	2	3
CO-4	2	3	3	3	3	3	3	3	2	3
CO-5	2	3	3	3	3	3	3	3	2	3
Ave.	2.2	2.6	2.8	2.8	2.8	2.8	2.8	2.8	2.2	2.8

SEMESTER –II			
CORE IV- COMPILER DESIGN			
Course Code:24PCSC21	**Hrs/week:5**	**Hrs/Semester:75**	**Credits:4**

Course Objectives:

1. To learn the process of translating a modern high-level language to executable code.
2. To identify the methods and strategies of parsing techniques.
3. To generate intermediate code, and to design syntax directed translation scheme and apply code optimization techniques.

Course Outcomes:

CO. No	**Upon Completion of this course, students will be able to**	**CL**
CO-1	learn the basic principles of compiler in high level programming language.	K1
CO-2	understand language tokens using regular expressions, finite automata.	K2
CO-3	apply parsing techniques and able to write Context Free Grammars for various languages.	K3
CO-4	analyze the knowledge of intermediate code generation to build efficient systems.	K4
CO-5	prove the knowledge on Run-time Environment.	K5

SEMESTER –II			
CORE IV- COMPILER DESIGN			
Course Code:24PCSC21	**Hrs/week: 5**	**Hrs/Semester:75**	**Credits:4**

UNIT:1 LEXICAL ANALYSIS

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens –Finite Automata – Regular Expressions to Automata – Minimizing the number of states of a DFA.

UNIT:2 SYNTAX ANALYSIS

Introduction – Context-free Grammars – Writing a Grammar – Top-Down Parsing – Bottom-Up parsing – LR Parsing – Ambiguous Grammar – Parser Generators.

UNIT:3 INTERMEDIATE CODE GENERATION

Syntax Directed Definitions - Evaluation Orders for Syntax Directed Definitions - Variants of Syntax trees – Three-Address Code – Types and Declarations – Translation of Expressions – Type Checking.

UNIT:4 RUN TIME ENVIRONMENTS AND CODE GENERATION

Storage Organization – Stack Allocation of Space - Access to Nonlocal Data on the Stack - Issues in the Design of a Code Generator – Target Language – Address in the Target Language - A Simple Code Generator.

UNIT:5 CODE OPTIMIZATION

Basic Blocks and Flow Graphs - Optimization of Basic Blocks - Peephole Optimization - Machine-Independent Optimizations: Introduction to Data-Flow Analysis.

Text Book:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffery D.Ullman. *Compilers: Principles, Techniques and Tools*. Pearson, 2nd Edition, 2014.

Reference Books:

1. J.P. Tremblay and P.G. Sorrenson. *The Theory and Practice of Compiler Writing*. McGraw Hill, 1985.
2. David Galles. *Modern Compiler Design.* Pearson Education Asia, 2007.
3. Steven S. Muchnick. *Advanced Compiler Design & Implementation*. Morgan Kaufmann Pulishers, 2000.

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	3	2	2	2	2	2	2	2	3	2
CO-3	2	3	3	3	2	3	3	3	2	2
CO-4	2	3	3	3	2	3	3	3	2	2
CO-5	2	2	2	2	3	2	2	2	2	3
Ave.	2.4	2.4	2.4	2.4	2.2	2.4	2.4	2.4	2.4	2.2

SEMESTER –II			
CORE V- NETWORK PROGRAMMING USING JAVA			
Course Code:24PCSC22	**Hrs/week:5**	**Hrs/Semester:75**	**Credits:4**

Course Objectives:

1. Enable the students to learn the basic functions, principles and concepts of advanced java programming.
2. Provide knowledge on concepts needed for distributed Application Architecture.
3. Learn JDBC, Servlet packages, JQuery, Java Server Pages and JAR file format.

Course Outcomes:

CO. No	Upon Completion of this course, students will be able to	CL
CO-1	recall the advanced concepts of Java Programming.	K1
CO-2	understand JDBC and RMI concepts.	K2
CO-3	apply and analyze Java in Database.	K3
CO-4	examine different event in java using the delegation event model, event listener and class.	K4
CO-5	design interactive applications using Java Servlet, JSP and JDBC	K4

SEMESTER –II			
CORE V- NETWORK PROGRAMMING USING JAVA			
Course Code:24PCSC22	**Hrs/week:5**	**Hrs/Semester:75**	**Credits:4**

Unit:1 ADVANCE NETWORKING

Networking Basics-Introduction of Socket- Types of Socket- Socket.API, TCP-IP: Client/Server Sockets-URL,UDP: Datagrams-java.net package classes: Socket-Server Socket- Inet Address-URL-URL Connection-RMI Architecture-Client Server Application using RMI.

Unit:2 JDBC PROGRAMMING

JDBC Architecture-Types of JDBC Drivers-Introduction to major JDBC-Classes and Interface-Creating simple JDBC Application-Types of Statement (Statement Interface, Prepared Statement, Callable Statement)-Exploring ResultSet Operations-Batch Updates in JDBC-Creating CRUD Application-Using RowSet Objects- Managing-Database Transaction.

Unit:3 J2EE AND WEB DEVELOPMENT

J2EE Architecture Types- J2EE Containers- Types of Servers in J2EE Application- HTTP Protocols and API- Request Processing in Web Application- Web Application Structure- Web Containers and Web Architecture Models.

Unit:4 SERVLET API AND OVERVIEW

Servlet Introduction-Servlet Life Cycle(SLC)- Types of Servlet-Servlet Configuration with Deployment Descriptor- Working with Servlet Context and Servlet Config Object-Attributes in Servelt-Response and Redirection using Request Dispacher and using sendRedirect Method-Filter API-Manipulating Responses using Filter API- Session Tracking: using Cookies-HTTP Session-Hidden Form Fields and URL Rewriting-Types of Servlet Event: Context Level and SessionLevel.

Unit:5 JAVA SERVER PAGES

Introduction to JSP - Comparison with Servlet- JSP Architecture-JSP: Life Cycle-Scripting Elements- Directives-Action Tags- Implicit Objects- Expression Language(EL)-JSP Standard Tag Libraries(JSTL)-Custom Tag- Session Management-Exception Handling-CRUD Application.

Text Book:

1. Keogh. *J2EE:The Complete Reference*. McGraw Hill India, 2002.
2. Phil Hanna. *The Complete Reference JSP*, Osborne/Mc Graw-Hill Publication, 2003.
3. Jamie Jaworski. *Java Unleased*. SAMS Techmedia Publications,1999.

Reference Book:

1. Budi Kurnaiwan. *Java for Web with Servlets,JSP and EJB:A Developer's Guide to J2EE Solutions.* New Riders Publishing.
2. Herbert Schildt. *Java, The Complete Reference*.Twelth Edition.

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	3	2	3	2	2	2	2	3	3	2
CO-3	2	3	3	3	2	3	3	3	2	3
CO-4	2	2	3	3	2	3	2	3	2	3
CO-5	2	3	3	3	3	3	3	3	2	3
Ave.	2.4	2.4	2.8	2.6	2.2	2.6	2.4	2.8	2.4	2.6

SEMESTER – II			
CORE VI - DIGITAL IMAGE PROCESSING			
Course Code : 24PCSC23	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 4**

Course Objectives:

1. Learn basic image processing techniques for solving real problems.
2. Gain knowledge in image transformation and Image enhancement techniques.
3. Learn Image compression and Segmentation procedures.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	learn different techniques employed for the enhancement of images.	K1
CO-2	understand the need for image transforms.	K2
CO-3	utilize theoretical knowledge and algorithms as the course progresses to solve more complex problems (e.g. for image restoration).	K4
CO-4	analyze specific problems and propose appropriate solutions through a combination of theoretical knowledge and programming techniques.	K3
CO-5	assess the performance of image processing algorithms and systems.	K5

SEMESTER – II			
CORE VI - DIGITAL IMAGE PROCESSING			
Course Code : 24PCSC23	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 4**

Unit: 1 FUNDAMENTALS

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: 2 IMAGE ENHANCEMENT

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: 3 IMAGE RESTORATION

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: 4 IMAGE COMPRESSION

Image Compression: Fundamentals–Image compression models–Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.

Unit: 5 IMAGE SEGMENTATION

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.* PHI/Pearson Education, Second Edition.
2. B.Chanda,D.Dutta Majumder. *Digital Image Processing and Analysis*. PHI, 2003.

Reference Books

1. NickEfford. *Digital Image Processing-a practical introducing using Java.* Pearson Education, 2004.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

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

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	3	3	3	2	2	2	3	3	3	2
CO-3	3	3	3	3	2	3	3	3	3	2
CO-4	3	3	3	3	2	3	3	3	3	2
CO-5	3	3	3	3	2	3	3	3	3	2
Ave.	3	2.8	2.8	2.6	2	2.6	2.8	2.8	3	2

SEMESTER – II			
CORE PRACTICAL III - DIGITAL IMAGE PROCESSING USING MATLAB LAB			
Course Code : 24PCSCR3	**Hrs / Week :4**	**Hrs / Sem :60**	**Credits :2**

Course Objectives:

1. To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques.
2. To enable the students to learn the fundamentals of image compression and segmentation
3. To understand Image Restoration & Filtering Techniques.
4. Implementation of the above using MATLAB.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	relate programs in MATLAB for image processing using the techniques.	K1
CO-2	understand different techniques and implement in real environment.	K2
CO-3	utilize theoretical knowledge and algorithms in programming.	K3
CO-4	analyze specific problems and propose appropriate solutions through a combination of theoretical knowledge and programming techniques.	K4
CO-5	compare various filtering methods.	K5

LIST OF PROGRAMS

1. 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.

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	3	2	2	3	3	3	2	2	3	3
CO-3	3	3	3	3	2	3	3	3	3	2
CO-4	2	2	3	3	3	3	2	3	2	3
CO-5	2	3	3	2	2	2	3	3	2	2
Ave.	2.6	2.4	2.6	2.6	2.4	2.6	2.4	2.6	2.6	2.4

SEMESTER – II			
CORE PRACTICAL IV - JAVA PROGRAMMING LAB			
Course Code : 24PCSCR4	**Hrs / Week :3**	**Hrs / Sem : 45**	**Credits :2**

Course Objectives:

1. To provide knowledge on using Servlets, Applets
2. To introduce JDBC and navigation of records
3. To understand RMI& its implementation
4. To introduce to Socket programming

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	recognize concepts of Java using HTML forms, JSP&JAR.	K1
CO-2	illustrate JDBC and RMI concepts.	K2
CO-3	write Applets with Event handling mechanism.	K3
CO-4	examine the knowledge in Socket programming.	K4
CO-5	create interactive web based applications using servlets and jsp .	K5

LIST OF PROGRAMS

1. Build a simple Client Server application using RMI.
2. Use connection-less and Use connection-oriented communication.
3. JDBC application with Database and perform the CURD task using statement object.
4. Write a JDBC application with Database and perform the following task:
    a) Create a store procedure which will insert one record into employee table.
    b) Create a store procedure which will retrieve salary for given employee id.
    c) Write a java application which will call the above procedure and display appropriate information on screen.
5. Testing the Servlet and study deployment descriptor.
6. State management using Cookies, Http Session and URL Rewriting.
7. Servlet file contains following functions:
    a) Connect
    b) Create Database
    c) Create Table
    d) Insert Records into respective table
    e) Update records of particular table of database
    f) Delete Records from table.
    g) Delete table and also database.
8. Perform Database Access through JSP.

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	3	3	3	2	2	2	3	3	3	2
CO-3	2	3	3	2	2	2	3	3	2	2
CO-4	3	2	3	3	2	3	2	3	3	2
CO-5	2	3	3	3	2	3	3	3	2	2
Ave.	2.6	2.6	2.8	2.4	2	2.4	2.6	2.8	2.6	2

SEMESTER – II			
Elective II A - BLOCKCHAIN TECHNOLOGY			
Course Code : 24PCSE21	**Hrs / Week : 4**	**Hrs / Sem : 60**	**Credits : 3**

Course Objectives:

1. Provide an overview of blockchain technology, including its origins and the differences between Bitcoin, crypto currencies, and blockchain.
2. Address privacy and security issues associated with blockchain technology.
3. Understand the principles of symmetric-key and public-key cryptography, digital signatures, and their applications in blockchain.
4. Explore the application of blockchain in machine-to-machine communication and data management within Industry 4.0.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	identify the key players, platforms, and regulatory bodies involved in the blockchain industry.	K1
CO-2	understand the principles of symmetric-key cryptography, public-key cryptography, and digital signatures, and their application in blockchain.	K2
CO-3	apply cryptographic techniques to secure blockchain transactions and ensure data integrity.	K3
CO-4	analyze the regulatory environment for cryptocurrencies and blockchain technology, including the perspectives of different stakeholders.	K4
CO-5	design and develop blockchain-based solutions for complex problems in various industries, ensuring compliance with regulatory requirements.	K5

SEMESTER – II			
Elective II A - BLOCKCHAIN TECHNOLOGY			
Course Code : 24PCSE21	**Hrs / Week : 4**	**Hrs / Sem : 60**	**Credits : 3**

UNIT: 1 INTRODUCTION

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: 2 NETWORK AND SECURITY

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: 3 CRYPTOCURRENCY

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: 4 CRYPTOCURRENCY REGULATION

Cryptocurrency Regulation- Stakeholders, Roots of Bitcoin, Legal views- exchange of cryptocurrency- Black Market- Global Economy. Cryptoeconomics– assets, supply and demand, inflation and deflation – Regulation.

UNIT: 5 CHALLENGES IN BLOCKCHAIN

Opportunities and challenges in Block Chain – Application of block chain: Industry 4.0 – machine to machine communication –Data management in industry 4.0–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, 2016.
2. Andreas Antonopoulos. *Mastering Bitcoin: Unlocking Digital Cryptocurrencies.* O'Reilly, First edition, 2015.

Reference Books

1. Satoshi Nakamoto. *Bitcoin: A Peer-to-Peer Electronic Cash System.* 2009."
2. Rodrigoda Rosa Righi,Antonio Marcos Alberti and Madhusudan Singh. *Blockchain Technology for Industry 4.0.* Springer 2020.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://onlinecourses.nptel.ac.in/noc22_cs44/preview
2. https://www.javatpoint.com/blockchain-tutorial
3. https://www.tutorialspoint.com/blockchain/index.htm

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO -1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	3	2	3	2	2	3	2
CO-2	3	2	2	2	2	2	2	2	3	2
CO-3	2	2	3	2	2	2	2	3	2	2
CO-4	2	2	3	3	3	3	2	3	2	3
CO-5	2	3	3	3	3	3	3	3	2	3
Ave.	2.4	2.2	2.6	2.6	2.4	2.6	2.2	2.6	2.4	2.4

SEMESTER – II			
ELECTIVE II B – THEORY OF COMPUTATION			
Course Code : 24PCSE22	**Hrs / Week :4**	**Hrs / Sem :60**	**Credits :3**

Course Objectives:

1. To provide the comprehensive insight into theory of computation by understanding grammar, languages and other elements of modern language design.
2. To develop capabilities to design and develop formulations for computing models.
3. Students will learn that certain problems do not admit efficient algorithms and identify such problems.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	define what a Regular Language is and construct a finite state machine for it.	K1
CO-2	understand Turing Machines and the simple primitive mechanisms needed for all computation.	K2
CO-3	solve computational problems regarding their computability and complexity and prove the basic results of the theory of computation.	K3
CO-4	analyse languages of Turing machine.	K4
CO-5	decide what makes some problems computationally hard and others easy.	K5

SEMESTER – II			
ELECTIVE II – THEORY OF COMPUTATION			
Course Code : 24PCSE21	**Hrs / Week :4**	**Hrs / Sem :60**	**Credits :3**

Unit:1 AUTOMATA FUNDAMENTALS

Introduction to formal proof — Additional forms of Proof — Inductive Proofs –Finite Automata — Deterministic Finite Automata — Non-deterministic Finite Automata — Finite Automata with Epsilon Transitions

Unit:2 REGULAR EXPRESSIONS AND LANGUAGES

Regular Expressions — FA and Regular Expressions — Proving Languages not to be regular — Closure Properties of Regular Languages — Equivalence and Minimization of Automata.

Unit:3 CONTEXT FREE GRAMMAR AND LANGUAGES

CFG — Parse Trees — Ambiguity in Grammars and Languages — Definition of the Pushdown Automata — Languages of a Pushdown Automata — Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

Unit:4 PROPERTIES OF CONTEXT FREE LANGUAGES

Normal Forms for CFG — Pumping Lemma for CFL — Closure Properties of CFL — Turing Machines — Programming Techniques for TM.

Unit:5 UNDECIDABILITY

Non Recursive Enumerable (RE) Language — Undecidable Problem with RE — Undecidable Problems about TM — Undecidability of Post's Correspondence Problem, The Class NP and co-NP.

Text Book:

1. John E. Hopcroft, Rajeev Motwani and Jeffery D. Ullman. *Automata Theory, Languages, and Computation*. Pearson Education, 3rd Edition, 2008.
2. Michael Sipser. *Introduction to the Theory of Computation*. Books/Cole Thomson Learning, 2001.
3. JE Hopcroft and JD Ullman. *Introduction to Automata Theory, Languages, and Computation.* Addison-Wesley.

Reference Book:

1. Michael Sipser. *Introduction to the Theory of Computation*.

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	3	2	3	2	2	3	2
CO-2	3	2	3	2	2	2	2	3	3	2
CO-3	2	3	3	3	2	3	3	3	2	2
CO-4	2	3	3	3	2	3	3	3	2	2
CO-5	2	2	3	3	3	3	2	3	2	3
Ave.	2.4	2.4	2.8	2.8	2.2	2.8	2.4	2.8	2.4	2.2

SEMESTER – II			
SKILL ENHANCEMENT COURSE – SOFT SKILLS			
Course Code : 24PCSSE2	**Hrs / Week :4**	**Hrs / Sem :60**	**Credits :3**

Course Objectives:

1. To provide a focused training on soft skills for students in colleges for better job prospects.
2. To communicate effectively and professionally.
3. To help the students take active part in group dynamics.
4. To familiarize students with numeracy skills for quick problem solving.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	CL
CO-1	recall various soft skill sets.	K1
CO-2	understand personal effectiveness in any managerial positions.	K2
CO-3	apply verbal and non-verbal reasoning skills to solve problems.	K3
CO-4	differentiate problems at work and home and design solutions to maintain work-life balance.	K4
CO-5	assess growth and sustainability and infuse creativity in employment that increases professional productivity.	K5

SEMESTER – II			
SKILL ENHANCEMENT COURSE – SOFT SKILLS			
Course Code : 24PCSSE2	**Hrs / Week :4**	**Hrs / Sem :60**	**Credits :3**

Unit: 1 EFFECTIVE COMMUNICATION & PROFESSIONAL COMMUNICATION

Definition of communication, Barriers of Communication, Non-verbal Communication; Effective Communication - Conversation Techniques, Good manners and Etiquettes; Speech Preparations & Presentations; Professional Communication.

Unit: 2 RESUME WRITING & INTERVIEW SKILLS

Resume Writing: What is a résumé? Types of résumés, - Chronological, Functional and Mixed Resume, Purpose and Structure of a Resume, Model Resume. Interview Skills: Types of Interviews, Preparation for an interview, Attire, Body Language, Common interview questions, Mock interviews & Practicum.

Unit: 3 GROUP DISCUSSION & PERSONAL EFFECTIVENESS

Basics of Group Discussion, Parameters of GD, Topics for Practice, Mock GD & Practicum & Team Building. Personal Effectiveness: Self Discovery; Goal Setting with questionnaires & Exercise.

Unit: 4 NUMERICAL ABILITY

Introducing concepts Average, Percentage; Profit and Loss, Simple Interest, Compound Interest; Time and Work, Pipes and Cisterns.

Unit: 5 TEST OF REASONING

Introducing Verbal Reasoning: Series Completion, Analogy; Data Sufficiency, Assertion and Reasoning; and Logical Deduction. Non-Verbal Reasoning: Series; and Classification.

Text Books

1. Melchias G., Balaiah, J. & Joy. *Winner in the Making: A Primer on soft Skills.* Trichy, India: St. Joseph's College. J. L. (Eds), 2018.

Reference Books

1. Aggarwal, R. S. *A Modern Approach to Verbal and Non-Verbal Reasoning.* S. Chand. 2010.
2. Covey.S.*7 Habits of Highly effective people.* Free Press. 2004
3. Gerard.E. *The Skilled Helper.* Brooks/Cole, 5th Edition, 1994.
4. Khera, S. *You Can Win.* Macmillan Books, 2003.
5. Murphy, R. *Essential English Grammar*. Cambridge University Press,2nd edition, 1998.
6. Sankaran, K., & Kumar, M. *Group Discussion and Public Speaking* .M.I. Publications, 5th edition, 2010.

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	2	2	2	2	2	2	3	2
CO-2	2	2	2	3	3	3	3	2	2	3
CO-3	2	2	3	3	3	3	3	3	2	3
CO-4	2	3	3	3	3	3	3	3	2	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	2.4	2.4	2.6	2.8	2.8	2.8	2.8	2.6	2.4	2.8