MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC, NBA & Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

Curriculum/Syllabus

Programme Code	:	**CS**
Programme Name	:	**B.E- COMPUTER SCIENCE AND ENGINEERING**
Regulation	:	**R-2019**

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Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

INSTITUTION VISION &MISSION

INSTITUTION VISION

To be a Centre of Excellence in Engineering, Technology and Management on par with International Standards.

INSTITUTION MISSION

- To prepare the students with high professional skills and ethical values
- To impart knowledge through best practices
- To instill a spirit of innovation through Training, Research and Development
- To undertake continuous assessment and remedial measures
- To achieve academic excellence through intellectual, emotional and social stimulation

INSTITUTION MOTTO

Rural upliftment through Technical Education.

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DEPARTMENT VISION & MISSION

DEPARTMENT VISION

To produce the Computer Science and Engineering students with the Innovative and Entrepreneur skills to face the challenges ahead

DEPARTMENT MISSION

- To impart knowledge in the state of art technologies in Computer Science and Engineering
- To inculcate the analytical and logical skills in the field of Computer Science and Engineering
- To produce the graduates to examine the issues and propose solutions with Ethical values

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DEPARTMENT PROGRAM EDUCATIONAL OBJECTIVES, PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES

PROGRAM EDUCATIONAL OBJECTIVES

The Computer Science and Engineering Graduates should be able to

PEO1: Graduates will be able to Practice as an IT Professional in Multinational Companies

PEO2: Graduates will be able to Gain necessary skills and to pursue higher education for career growth

PEO3: Graduates will be able to Exhibit the leadership skills and ethical values in the day to day life

PROGRAM OUTCOMES

PO1 - **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 - **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 - **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 - **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 - **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 - **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 - **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: Graduates should be able to design and analyze the algorithms to develop an Intelligent Systems

PSO2: Graduates should be able to apply the acquired skills to provide efficient solutions for real time problems

PSO3: Graduates should be able to exhibit an understanding of System Architecture, Networking and Information Security

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COMPUTER SCIENCE AND ENGINEERING

REGULATION – 2019

GROUPING OF COURSES

HUMANITIES AND SOCIAL SCIENCES COURSES (HS)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	19HSS01	Business English	HS	2	2	0	0	2
2.	19HSS02	English Communicative Skills Laboratory	HS	2	0	0	2	1
3.	19HSS03	Life Skills and Workplace Psychology	HS	2	2	0	0	2
4.	19HSS04	Technical English For Engineers	HS	2	2	0	0	2
5.	19HSS05	Communicative English for Engineers	HS	2	2	0	0	2
6.	19HSS06	Basics of Japanese Language	HS	2	2	0	0	2
7.	19HSS07	Basics of French Language	HS	2	2	0	0	2

BASIC SCIENCES COURSES (BS)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	19BSS01	Engineering Physics	BS	3	3	0	0	3
2.	19BSS02	Physics and Chemistry Laboratory	BS	2	0	0	2	1
3.	19BSS03	Bio and Nanomaterials Sciences	BS	3	3	0	0	3
4.	19BSS04	Material Sciences	BS	3	3	0	0	3
5.	19BSS05	Physics for Mechanical Engineers	BS	3	3	0	0	3
6.	19BSS11	Engineering Chemistry	BS	3	3	0	0	3
7.	19BSS12	Environmental Science and Engineering	BS	3	3	0	0	3
8.	19BSS13	Organic Chemistry	BS	3	3	0	0	3
9.	19BSS14	Physical Chemistry	BS	3	3	0	0	3
10.	19BSS15	Applied Chemistry	BS	3	3	0	0	3
11.	19BSS16	Organic Chemistry Laboratory	BS	3	0	0	3	1

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12.	19BSS17	Physical Chemistry Laboratory	BS	3	0	0	3	1
13.	19BSS21	Algebra and Calculus	BS	4	3	1	0	4
14.	19BSS22	Differential Equations and Vector Analysis	BS	4	3	1	0	4
15.	19BSS23	Transforms and Partial Differential Equations	BS	4	3	1	0	4
16.	19BSS24	Discrete Mathematics	BS	4	3	1	0	4
17.	19BSS25	Statistical and Queuing Model	BS	4	3	1	0	4
18.	19BSS26	Numerical Methods	BS	4	3	2	0	4
19.	19BSS27	Probability and Random Processes	BS	4	3	2	0	4
20.	19BSS28	Statistic and Numerical Methods	BS	4	3	2	0	4

GENERAL ENGINEERING SCIENCE COURSES (GES)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	19GES01	Programming for Problem Solving Using C	GES	3	3	0	0	3
2	19GES02	Programming for Problem Solving Technique	GES	3	3	0	0	3
3	19GES03	Programming in C Laboratory	GES	2	0	0	2	1
4	19GES04	Programming in C and Python Laboratory	GES	2	0	0	2	1
5	19GES05	Electrical and Electronic Sciences	GES	3	3	0	0	3
6	19GES06	Mechanical and Building Sciences	GES	3	3	0	0	3
7	19GES07	Computer Aided Drafting Laboratory	GES	2	0	0	2	1
8	19GES08	Python Programming	GES	3	3	0	0	3
9	19GES09	Programming in Python Laboratory	GES	2	0	0	2	1
10	19GES10	Soft Skills Laboratory	GES	2	0	0	2	1
11	19GES11	Electronic Devices	GES	3	3	0	0	3
12	19GES12	Electronic Simulation Laboratory	GES	2	0	0	2	1
13	19GES13	Electric Circuits	GES	3	2	1	0	3
14	19GES14	Electric Circuits Laboratory	GES	2	0	0	2	1
15	19GES15	Manufacturing Process	GES	3	3	0	0	3
16	19GES16	Manufacturing Process Laboratory	GES	2	0	0	2	1
17	19GES17	Mechanical and Building Sciences	GES	2	0	0	2	1

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		Laboratory						
18	19GES18	Construction Materials	GES	3	3	0	0	3
19	19GES19	Concepts in Product Design	GES	3	3	0	0	3
20	19GES20	Renewable Energy Sources	GES	3	3	0	0	3
21	19GES21	Electrical Drives and Control	GES	3	3	0	0	3
22	19GES22	Electrical Drives and Control Laboratory	GES	2	0	0	2	1
23	19GES23	Analog and digital communication	GES	3	3	0	0	3
24	19GES24	Digital Principles and System Design	GES	3	3	0	0	3
25	19GES25	Digital Principles and System Design Laboratory	GES	2	0	0	2	1
26	19GES26	Engineering Drawing	GES	5	1	0	4	3
27	19GES27	Engineering Geology	GES	3	3	0	0	3
28	19GES28	Engineering Mechanics	GES	4	3	1	0	4
29	19GES29	Wireless Communication	GES	4	3	1	0	4
30	19GES30	Electronics and Microprocessor	GES	3	3	0	0	3
31	19GES31	Electronics and Microprocessor Laboratory	GES	2	0	0	2	1
32	19GES32	Data Structures using Python	GES	3	3	0	0	3

PROFESSIONAL CORE (PC)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	19CSC01	Data Structures and Algorithms	PC	3	3	0	0	3
2	19CSC02	Data Structures Lab Using C++ Lab	PC	2	0	0	2	1
3	19CSC03	Database Management Systems	PC	3	3	0	0	3
4	19CSC04	Database Management Systems Lab	PC	2	0	0	2	1
5	19CSC05	Computer Organization and Architecture	PC	3	3	0	0	3
6	19CSC06	Object Oriented Programming	PC	3	3	0	0	3
7	19CSC07	Computer Networks	PC	3	3	0	0	3

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8	19CSC08	Computer Networks Lab	PC	2	0	0	2	1
9	19CSC09	Operating Systems`	PC	3	3	0	0	3
10	19CSC10	Operating Systems Lab	PC	2	0	0	2	1
11	19CSC11	Design and Analysis of Algorithms	PC	3	3	0	0	3
12	19CSC12	Software Engineering	PC	3	3	0	0	3
13	19CSC13	Service Oriented Architecture	PC	3	3	0	0	3
14	19CSC14	Mobile Communication	PC	3	3	0	0	3
15	19CSC15	Mobile Application Lab	PC	2	0	0	2	1
16	19CSC16	Data Analytics using R and Python	PC	3	3	0	0	3
17	19CSC17	Theory of Computation	PC	3	3	0	0	3
18	19CSC18	Cloud Computing	PC	3	3	0	0	3
19	19CSC19	Cloud Computing Lab	PC	2	0	0	2	1
20	19CSC20	Compiler Design	PC	3	3	0	0	3
21	19CSC21	Compiler Design Lab	PC	2	0	0	2	1
22	19CSC22	Artificial Intelligence for Industry 4.0	PC	3	3	0	0	3
23	19CSC23	Object Oriented Analysis and Design	PC	3	3	0	0	3
24	19CSC24	Case Tools Lab	PC	2	0	0	2	1
25	19CSC25	Cryptography and Network Security	PC	3	3	0	0	3
26	19CSC26	Cryptography and Network Security Lab	PC	2	0	0	2	1
27	19CSC27	Big Data Analytics	PC	3	3	0	0	3
28	19CSC28	Animation: Theory and Practice	PC	3	3	0	0	3
29	19CSC29	Machine Learning Techniques	PC	3	3	0	0	3
30	19SC30	Data Analytics and Modeling Techniques	PC	3	3	0	0	3
31	19CSC31	Machine Learning	PC	3	3	0	0	3

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COMPUTER SCIENCE AND ENGINEERING

PROFESSIONAL ELECTIVE (PE)

S. No	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	19CSE01	Internet of Things	PE	3	3	0	0	3
2	19CSE02	Internet of Things Lab	PE	2	0	0	2	1
3	19CSE03	Salesforce CRM and Platform	PE	3	3	0	0	3
4	19CSE04	Salesforce CRM and Platform Lab	PE	2	0	0	2	1
5	19CSE05	AWS Academy Cloud Developing	PE	3	3	0	0	3
6	19CSE06	AWS Academy Cloud Developing Lab	PE	2	0	0	2	1
7	19CSE07	AWS Academy Cloud Architecting	PE	3	3	0	0	3
8	19CSE08	AWS Academy Cloud Architecting Lab	PE	2	0	0	2	1
9	19CSE09	Internet Programming	PE	3	3	0	0	3
10	19CSE10	Current Practices in Software Engineering	PE	3	3	0	0	3
11	19CSE11	Computer Graphics	PE	3	3	0	0	3
12	19CSE12	Distributed Programming	PE	3	3	0	0	3
13	19CSE13	Enterprise Project Development using FOSS	PE	3	3	0	0	3
14	19CSE14	Parallel Computing	PE	3	3	0	0	3
15	19CSE15	Kernel Programming	PE	3	3	0	0	3
16	19CSE16	Soft Computing Techniques	PE	3	3	0	0	3
17	19CSE17	Virtual Reality	PE	3	3	0	0	3
18	19CSE18	Storage infrastructure Management	PE	3	3	0	0	3
19	19CSE19	Total Quality Management	PE	3	3	0	0	3
20	19CSE20	Cloud infrastructure services	PE	3	3	0	0	3
21	19CSE21	Graphics and multimedia	PE	3	3	0	0	3
22	19CSE22	Graphics and multimedia laboratory	PE	3	0	0	2	1
23	19CSE23	Data warehousing and data mining	PE	3	3	0	0	3
24	19CSE24	Software quality assurance	PE	3	3	0	0	3

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25	19CSE25	Network and routing protocols	PE	3	3	0	0	3
26	19CSE26	Scaling and connecting networks	PE	3	3	0	0	3
27	19CSE27	Open stack essentials	PE	3	3	0	0	3
28	19CSE28	Software Defined Networks	PE	3	3	0	0	3
29	19CSE29	Docker and Kubernetes	PE	3	3	0	0	3
30	19CSE30	Blockchain	PE	3	3	0	0	3
31	19CSE31	User Centric Design	PE	3	3	0	0	3
32	19CSE32	Node.js and React.js	PE	3	3	0	0	3
33	19CSE33	C# and .NET Core	PE	3	3	0	0	3
34	19CSE34	Agile Methodology	PE	3	3	0	0	3
35	19CSE35	Text Mining	PE	3	3	0	0	3
36	19CSE36	Angular JS	PE	3	3	0	0	3
37	19CSE37	Deep Learning	PE	3	3	0	0	3
38	16CSE38	Ubiquitous Computing	PE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EE)

S. No	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	19CSP01	Project work-Phase I	EC	6	0	0	6	3
2	19CSP02	Project work-Phase II	EC	15	0	0	15	12
3	19CSP03	Comprehension	EC	4	0	0	4	2
4	19CSP04	Technical Seminar	EC	4	0	4	0	2
5	19CSP05	Entrepreneurship Development	EC	3	3	0	0	3
6	19CSP06	Professional Practices	EC	6	0	0	6	3
7	19CSP07	NPTEL- Introduction to Industry 4.0 and Industrial Internet of Things	EC	-	-	-	-	-
8	19CSP8	NPTEL- Introduction to Machine Learning	EC	-	-	-	-	-
9	19CSP9	NPTEL- The Joy of Computing using Python	EC	-	-	-	-	-

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10	19CSP10	NPTEL-Data Analytics with Python	EC	-	-	-	-	-
11	19CSP11	Indian Constitution	EC	-	-	-	-	-
12	19CSP12	Value Education	EC	-	-	-	-	-
13	19CSP13	Disaster Management	EC	-	-	-	-	-
14	19CSP14	Pedagogy Studies	EC	-	-	-	-	-
15	19CSP15	Stress Management by Yoga	EC	-	-	-	-	-

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Department	Computer Science & Engineering
Programme	B.E

SEMESTER – I

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19HSS01	Business English	2	0	0	2	2
2.	19BSS21	Algebra and Calculus	3	1	0	4	4
3.	19BSS01	Engineering Physics	3	0	0	3	3
4.	19BSS11	Engineering Chemistry	3	0	0	3	3
5.	19GES01	Programming for Problem Solving Using C	3	0	0	3	3
6.	19GES06	Mechanical and Building Sciences	3	0	0	3	3
PRACTICALS							
7.	19BSS02	Physics and Chemistry Lab	0	0	2	1	2
8.	19GES03	Programming in C Lab	0	0	2	1	2
9.	19HSS02	English Communicative Skills Lab	0	0	2	1	2
		Total Credits				**21**	

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Department	Computer Science & Engineering
Programme	B.E

SEMESTER – II

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19HSS03	Life Skills and Workplace Psychology	2	0	0	2	2
2.	19BSS22	Differential Equations and Vector Analysis	3	1	0	4	4
3.	19BSS03	Bio and Nanomaterials Sciences	3	0	0	3	3
4.	19BSS12	Environmental Science and Engineering	3	0	0	3	3
5.	19GES19	Concepts in Product Design	3	0	0	3	3
6.	19GES08	Python Programming	3	0	0	3	3
PRACTICALS							
7.	19GES10	Soft Skills Laboratory	0	0	2	1	2
8.	19GES09	Programming in Python Laboratory	0	0	2	1	2
		Total Credits				**20**	

01/12/21

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Department	Computer Science & Engineering
Programme	B.E

SEMESTER – III

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19CSC06	Object Oriented Programming	3	0	0	3	3
2.	19CSC01	Data Structures and Algorithms	3	0	0	3	3
3.	19GES24	Digital Principles and System Design	3	0	0	3	3
4.	19BSS23	Transforms and Partial Differential Equations	3	1	0	4	4
5.	19CSC03	Database Management Systems	3	0	0	3	3
6.	19CSC05	Computer Organization and Architecture	3	0	0	3	3
PRACTICALS							
7.	19CSC04	Database Management Systems Laboratory	0	0	2	1	2
8.	19CSC02	Data Structures Lab using C++ Laboratory	0	0	2	1	2
9.	19GES25	Digital Principles and System Design Lab	0	0	2	1	2
		Total Credits				**22**	

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Department	Computer Science & Engineering
Programme	B.E

SEMESTER – IV

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19CSC07	Computer Networks	3	0	0	3	3
2.	19CSC09	Operating Systems	3	0	0	3	3
3.	19CSC11	Design and Analysis of Algorithms	3	0	0	3	3
4.	19CSC12	Software Engineering	3	0	0	3	3
5.	19CSC13	Service Oriented Architecture	3	0	0	3	3
6.	PE	Professional Elective - I	3	0	0	3	3
PRACTICALS							
7.	19CSC08	Computer Network Lab	0	0	2	1	2
8.	19CSC10	Operating Systems Lab	0	0	2	1	2
9.	PE	Professional Elective I - Lab	0	0	2	1	2
		Total Credits				**21**	

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Department	Computer Science & Engineering
Programme	B.E

SEMESTER – V

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19CSC14	Mobile Communication	3	0	0	3	3
2.	19CSC17	Theory of Computation	3	0	0	3	3
3.	19CSC18	Cloud Computing	3	0	0	3	3
4.	19BSS24	Discrete Mathematics	3	1	0	4	5
5.	PE	Professional Elective - II	3	0	0	3	3
6.	OE	Open Elective – I	3	0	0	3	3
PRACTICALS							
7.	19CSC15	Mobile Application Lab	0	0	2	1	2
8.	19CSC19	Cloud Computing Lab	0	0	2	1	2
9.	PE	Professional Elective II - Lab	0	0	2	1	2
		Total Credits				**22**	

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Programme	B.E

SEMESTER – VI

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19CSC31	Machine Learning	3	0	0	3	3
2.	19CSC20	Compiler Design	3	0	0	3	3
3.	19CSC22	Artificial Intelligence for Industry 4.0	3	0	0	3	3
4.	19CSC23	Object Oriented Analysis and Design	3	0	0	3	3
5.	PE	Professional Elective – III	3	0	0	3	3
6.	OE	Open Elective – II	3	0	0	3	3
PRACTICALS							
7.	19CSC21	Compiler Design Lab	0	0	2	1	2
8.	19CSC24	Case Tools Lab	0	0	2	1	2
9.	PE	Professional Elective III - Lab	0	0	2	1	2
		Total Credits				**21**	

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Department	Computer Science & Engineering
Programme	B.E

SEMESTER – VII

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1	19CSC27	Big Data Analytics	3	0	0	3	3
2.	19CSC30	Data Analytics and Modeling Techniques	3	0	0	3	3
3.	PE	Professional Elective - IV	3	0	0	3	3
4.	PE	Professional Elective - V	3	0	0	3	3
5.	PE	Professional Elective - VI	3	0	0	3	3
6.	OE	Open Elective- III	3	0	0	3	3
PRACTICALS							
7.	19CSP01	Project Work - I	0	0	6	3	6
		Total Credits				**21**	

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Department	Computer Science & Engineering
Programme	B.E

SEMESTER – VIII

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.		Mandatory Course(NPTEL)	-	-	-	-	-
PRACTICALS							
2.	19CSP02	Project Work II	0	0	15	12	15
		Total Credits				**12**	

Total credits to be earned for the award of the degree 160

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COMPUTER SCIENCE AND ENGINEERING

19CSC01 **DATA STRUCTURES AND ALGORITHMS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

1. To know about the basic concepts of data structures and algorithms.
2. Apply the different linear and non-linear data structures for problem Solutions.
3. To understand the limitations of Algorithm Notations.
4. Exemplify the concept of Stack and Queue with suitable Applications
5. Classify the Tree Data structures and explain the suitable Applications.

COURSE OUTCOMES

At the end of the course, the students will be able to

19CSC01.CO1	Identify the appropriate efficient data structure for given problem
19CSC01.CO2	Develop applications using stack and queue data structures
19CSC01.CO3	Design linked list data structures for various applications
19CSC01.CO4	Implement various tree data structure
19CSC01.CO5	Compare efficiency of various sorting techniques and Demonstrate the hash function concepts of collision and its resolution methods

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC01.CO1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
19CSC01.CO2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
19CSC01.CO3	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X
19CSC01.CO4	X	X	X	X	X	X	X	-	-	X	X	X	X	X	X
19CSC01.CO5	X	X	X	X	X	X	X	-	-	X	X	X	X	X	X

UNIT I INTRODUCTION 9

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

UNIT II STACKS AND QUEUES 9

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: E pression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

UNIT III LINKED LIST 9

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of stack and queue ,header nodes, doubly linked list ; operations on it and algorithm Analysis; circular linked list :all operations their algorithms and complexity analysis.

UNIT IV TREES 9

Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with Complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis

UNIT V SORTING AND HASHING 9

Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing Techniques

TOTAL:L: 45

TEXT BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	M.A.Weiss	Data Structures and Algorithm Analysis in C++	Pearson Education Asia	2013
2.	Ellis Horowitz, SartajSahni	Fundamentals of Data Structures	Computer Science Press	2004

REFERENCE BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Michael T. Goodrich, Roberto Tamassia, David M. Mount	Data Structures and Algorithms in C++	Second Edition	2009
2.	G. A. V. PAI	Data structures and algorithms in C++	1st Edition	2008

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19CSC02	DATA STRUCTURES USING C++ LAB	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

1. write a C++ Program
2. Learn the knowledge about linked list
3. Execute the programs in Stack, Queue, Tree
4. Provide the knowledge about various searching and sorting techniques.

COURSE OUTCOMES:

At the end of the course, the students will be able to

19CSC02.CO1 Classify various operations on singly and doubly linked list

19CSC02.CO2 Illustrate stack programs using C++.

19CSC02.CO3 Apply the concept of queue using an array.

19CSC02.CO4 Develop binary search tree and B-tree

19CSC02.CO5 Build various sorting techniques

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC02.CO1	X	X	X	X	X	X	X		X	X	X	X	X	X	X
19CSC02.CO2	X	X	X	X	X	X	X		X	X	X	X	X	X	X
19CSC02.CO3	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X
19CSC02.CO4	X	X	X	X	X	X	X	-	-	X	X	X	X	X	X
19CSC02.CO5	X	X	X	X	X	X	X	-	-	X	X	X	X	X	X

LIST OF PROGRAMS

1. Write a C++ program that uses functions to perform the following: a) Create a singly linked list of integers.
   b) Delete a given integer from the above linked list. c) Display the contents of the above list after deletion
2. Write a template based C++ program that uses functions to perform the following: a) Create a doubly linked list of elements. b) Delete a given element from the above doubly linked list. c) Display the contents of the above list after deletion.
3. Write a C++ program that uses stack operations to convert a given infix expression into its postfix equivalent, Implement the stack using an array.
4. Write a C++ program to implement a double ended queue ADT using an array, using a doubly linked list.
5. Write a C++ program that uses functions to perform the following: a) Create a binary search tree of characters. b) Traverse the above Binary search tree recursively in preorder, in order and post order

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6. Write a C++ program that uses function templates to perform the following: a) Search for a key element in a list of elements using linear search. b) Search for a key element in a list of sorted elements using binary search.
7. Write a C++ program that implements Insertion sort algorithm to arrange a list of integers in ascending order.
8. Write a template based C++ program that implements selection sort algorithm to arrange a list of elements in descending order.
9. Write a C++ program that implements Heap sort algorithm for sorting a list of integers in ascending order.
10. Write a C++ program that implements Merge sort algorithm for sorting a list of integers in ascending order

TOTAL :P: 30

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19CSC03 **DATABASE MANAGEMENT SYSTEMS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

1. Identify the basic concepts and various data model used in database design ER modeling concepts and architecture
2. Recognize the use of normalization and functional dependency, indexing and hashing technique used in database design.
3. Apply the concept of transaction, concurrency control and recovery in database
4. Formulate the solution to data retrieval and data update using SQL
5. Demonstrate PL/SQL programming using Cursor Management and Triggers

COURSE OUTCOMES

At the end of the course, the students will be able to

19CSC03.CO1	Understand to draw the E-R diagram for the given Relation and use the Data model in Database Design
19CSC03.CO2	Apply the Normalization in optimize storage space
19CSC03.CO3	Design the Hashing Techniques and B+ Tree
19CSC03.CO4	Analysis the Concept of Transaction with Concurrency Control and Timestamp in Database
19CSC03.CO5	Evaluate SQL queries on Data Retrieval

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC03.CO1	X	X	X	-	-	-	-	-	X	-	X	X	X	X	-
19CSC03.CO2	X	X	X	X	X	X	-	-	-	-	X	X	X	X	X
19CSC03.CO3	X	X	X	X	X	-	-	X		X	X	X	X	-	X
19CSC03.CO4	X	X	X	X	-	-	-	X	-	X	X	X	X	X	X
19CSC03.CO5	X	X	X	X	-	X	-	X	-	-	X	X	X	X	X

UNIT I INTRODUCTION AND CONCEPTUAL MODELING 9

Introduction to File and Database systems- Database system structure – Data Models – Introduction to Network and Hierarchical Models – ER model – Relational Model – Relational Algebra and Calculus.

UNIT II RELATIONAL MODEL 11

SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design – Functional dependencies and Normalization for Relational Databases (up to BCNF).

UNIT III DATA STORAGE AND QUERY PROCESSING 9

Record storage and Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files –Different types of Indexes- B-Tree - B+Tree – Query Processing.

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UNIT IV TRANSACTION MANAGEMENT 9

Transaction Processing – Introduction- Need for Concurrency control- Desirable properties of Transaction- Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Time stamp based concurrency control – Recovery Techniques – Concepts- Immediate Update- Deferred Update - Shadow Paging.

UNIT V CURRENT TRENDS 7

Object Oriented Databases – Need for Complex Data types- OO data Model- Nested relations- Complex Types- Inheritance Reference Types - Distributed databases- Homogenous and Heterogeneous- Distributed data Storage – XML – Structure of XML- Data- XML Document- Schema- Querying and Transformation. – Data Mining and Data Warehousing

TOTAL:L : 45

TEXT BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Abraham Silberschatz, Henry F.Korth S.Sudharshan	Database System Concepts	Tata McGraw-Hill	2013
2.	Ramez Elma sri Shamkant B.Navathe	Fundamentals of Database Systems	Pearson Education	2011

REFERENCE BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Raghu Ramakrishnan Johannes Gehrke	Database Management Systems	Tata McGraw-Hill	2014
2.	Hector Garcia-Molina Jeffrey D.Ullman Jennifer Widom	Database Systems: The Complete book	Pearson Education	2013
3.	Shefali Naik	Concepts of Database Management Systems	Pearson Education	2013
4.	G.K.Gupta	Database Management Systems	Tata McGraw Hill	2011
5.	RobCornell	Database Systems Design and Implementation	Cengage Learning	2011

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COMPUTER SCIENCE AND ENGINEERING

19CSC04	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. Understand and Write a query
2. To design a simple DB using data modeling techniques.
3. Analysis various DB tool .
4. Construct the VB as front end and DB SQL as back end.
5. Implement PL/SQL program in real time.

COURSE OUTCOMES:

At the end of the course, the students will be able to

19CSC04.CO1	Execute query using SQL DML/DDL Commands.
19CSC04.CO2	Implement programs using PL/SQL including stored procedures, cursors, packages etc
19CSC04.CO3	Construct real time database application using current techniques.
19CSC04.CO4	Analyses the DB tool in various real time application.
19CSC04.CO5	Develop the VB as front end and SQL as back end.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC04.CO1	X	X	X	X	-	-	-	-	-	-	X	X	X	X	X
19CSC04.CO2	X	X	X	X	X	X	-	-	-	-	X	X	X	X	X
19CSC04.CO3	X	X	X	X	X	-	-	X		X	X	X	X	X	X
19CSC04.CO4	X	X	X	X	-	X	-	X	-	X	X	X	X	X	X
19CSC04.CO5	X	X	X	X	X	X	-	X	-	-	X	X	X	X	X

LIST OF PROGRAMS

1. Implementation of DDL commands in RDBMS.
2. Implementation of DML and DCL commands in RDBMS.
3. Implementation of Date and Built in Functions of SQL.
4. Implementation of Simple Programs in PL/SQL
5. Implementation of High-level language extension with Cursors.
6. Implementation of High-level language extension with Triggers
7. Implementation of stored Procedures and Functions.
8. Embedded SQL.

9. Database design using E-R model and Normalization.
10. Database Connectivity using ADO
11. Database Connectivity using ODBC
12. Database Connectivity using JDBC

TOTAL :P: 30

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19CSC05 COMPUTER ORGANIZATION AND ARCHITECTURE

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

1. To understand the basic structure of a digital computer
2. To familiarize with implementation of fixed point and floating-point arithmetic operations
3. To enhance the processor operation by employing pipelining
4. To understand the concept of various memories and interfacing
5. To expose with different ways of communicating with I/O devices and standard I/O interfaces

COURSE OUTCOMES

At the end of the course, the students will be able to

19CSC05.C01	Describe data representation, instruction formats and the operation of a digital computer
19CSC05.CO2	Illustrate the fixed point and floating-point arithmetic for ALU operation
19CSC05.CO3	Discuss about implementation schemes of control unit and analyze pipeline performance
19CSC05.CO4	Evaluate performance of memory systems
19CSC05.CO5	Identify the methods of accessing I/O devices and the use of standard I/O interfaces

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC05.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19CSC05.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19CSC05.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19CSC05.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19CSC05.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT I BASIC STRUCTURE OF COMPUTERS 9

Functional Units - Basic Operational Concepts - Bus Structures - Performance - Memory Locations and Addresses - Memory Operations - Instruction and Instruction Sequencing - Addressing Modes - Basic I/O Operations

UNIT II ARITHMETIC UNIT 9

Addition and Subtraction of Signed Numbers - Design of Fast Adders - Multiplication of Positive Numbers - Signed Operand Multiplication - Fast Multiplication - Integer Division - Floating Point Numbers and Operations

UNIT III BASIC PROCESSING UNIT AND PIPELINING 9

Fundamental Concepts - Execution of a Complete Instruction - Multiple Bus Organization - Hardwired Control - Microprogrammed Control - Pipelining - Basic Concepts - Data Hazards - Instruction Hazards - Influence on Instruction Sets - Datapath and control considerations - Superscalar operation

UNIT IV MEMORY SYSTEM 9

Basic Concepts - Semiconductor RAM - ROM - Speed, Size and Cost - Cache Memories -Performance Considerations - Virtual Memory - Memory Management Requirements Secondary Storages.

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UNIT V INPUT / OUTPUT ORGANIZATION 9

Accessing I/O Devices – Interrupts – Direct Memory Access – Buses–Standard I/O Interfaces (PCI, SCSI, USB).

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Carl Hamacher, ZvonkoVranesic and SafwatZaky	Computer Organization	Fifth Edition, McGraw-Hill	2002
2.	V.P. Heuring; H.F. Jordan	Computer Systems Design and Architecture	Second Edition, Pearson Education	2004
3.	Govindarajalu	Computer Architecture and Organization, Design Principles and Applications	First edition, Tata Mc Graw Hill	2005

REFERENCE BOOKS :

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Computer Organization and Architecture - Designing for Performance	Ninth Edition, Prentice Hall	2012
2.	David A.Patterson and John L.Hennessy	Computer Organization and Design: The hardware/ software interface	Fourth Edition, Morgan Kaufmann	2012
3.	John P.Hayes	Computer Architecture and Organization	Third Edition, McGraw Hill	2012
4.	J. Murdocca and Vincent P. Heuring	Computer Architecture and Organization: An Integrated approach	Second edition, Wiley India Pvt Ltd	2015
5.	Behrooz Parhami	Computer Architecture	Oxford University Press	2007

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19CSC06 **OBJECT ORIENTED PROGRAMMING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

1. Understand Object Oriented Programming concepts and basic characteristics of Java
2. Illustrate the principles of packages, inheritance and interfaces
3. Describe exceptions and use I/O streams
4. Develop a java application with threads and generics classes
5. Build simple Graphical User Interfaces

COURSE OUTCOMES

At the end of the course, the students will be able to

19CSC06.CO1 Understand Java programs using OOP principles
19CSC06.CO2 Apply Java programs with the concepts inheritance and interfaces
19CSC06.CO3 Construct Java applications using exceptions and I/O streams
19CSC06.CO4 Develop Java applications with threads and generics classes
19CSC06.CO5 Implement interactive Java programs using swings

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC06.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19CSC06.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19CSC06.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19CSC06.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19CSC06.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members - Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists – Strings.

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files.

UNIT IV : MULTITHREADING AND GENERIC PROGRAMMING 9

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, and thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Herbert Schildt	Java The complete reference", 8th Edition	McGrawHill Education	2011
2.	Cay S. Horstmann, Gary cornell	"Core Java Volume –I Fundamentals", 9th Edition	Prentice Hall	2013

REFERENCE BOOKS :

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Paul Deitel, Harvey Deitel,	Java SE 8 for programmers", 3rd Edition	Pearson,	2015
2.	Steven Holzner,	Java 2 Black book	Dreamtech press	2011
3.	Timothy Budd	Understanding Object-oriented programming with Java	Pearson Education	2000
4.	Robert Lafore	Object-oriented programming in Microsoft C++	Pearson Education	1991
5.	Vaskaran Sarcar	Interactive Object-Oriented Programming in Java: Learn and Test Your Programming Skills	Apress	2016

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COMPUTER SCIENCE AND ENGINEERING

19CSC07 **COMPUTER NETWORKS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES :

1. To Understand the state-of-the-art in network protocols, architectures and applications.
2. To Gain knowledge about the functions of different network layers
3. To be familiar with the transmission media and tools
4. To learn about IEEE standards in computer networking
5. To get familiarized with different protocols and network components

COURSE OUTCOMES :

At the end of the course, students will be able to

19CSC07.CO1 Paraphrase the role of each layer in computer networks and its protocols.

19CSC07.CO2 Develop scheme for error detection and correction and Select flow control algorithm at link to link level.

19CSC07.CO3 Evaluate the performance of various routing algorithms in networks.

19CSC07.CO4 Analyze the flow control and congestion control algorithms for QoS at end to end level.

19CSC07.CO5 Define the actual communication and cryptographic authentication.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC07.CO1	x	-	x	-	-	x	-	-	-	-	-	x	-	x	-
19CSC07.CO2	-	x	-	-	x	x	-	-	-	x	x	-	x	x	-
19CSC07.CO3	-	-	x	-	-	x	-	-	x	-	-	x	-	-	x
19CSC07.CO4	x	x	-	x	-	-	x	-	-	x	-	-	x	-	-
19CSC07.CO5	x	-	-	-	-	x	x	-	-	x	-	x	x	-	-

UNIT I INTRODUCTION 8

Overview: Data Communication -Network Types–Topology-Network model: OSI Model, T C P /IP Protocol Suite-Performance-Transmission Media: Guided Media-Unguided Media .

UNIT II DATA LINK LAYER 10

Error Detection and Correction - Flow Control-Data Link Control-Data Link Layer Protocols- HDLC- PPP- Media Access Control-Ethernet- WirelessLANs:IEEE802.11,Bluetooth

UNIT III NETWORK LAYER 9

Logical Addressing: IPv4Addresses – subnetting – CIDR - IPv6Addresses–Internetworking -IPv4-IPv6-Transition from IPv4 to IPv6–AddressMapping: ARP- RARP- DHCP

UNIT IV ROUTING AND TRANSPORT LAYER 9

Routing Protocols : Distance Vector Routing – Link state Routing- RIP–OSFF–BGP- Multicast Routing. Transport Layer: UDP - Overview of TCP- TCP flow control- TCP Error control - Congestion Control - Quality of Service

UNIT V APPLICATION LAYER AND SECURITY 9

World Wide Web and HTTP - FTP - Electronic Mail -Domain Name System - Cryptographic Algorithms - Authentication Protocols - Message Integrity Protocols - Firewalls.

TOTAL: L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Data and Computer Communications	Pearson Education	2013
2.	Behrouz A Forouzan	Data Communications and Networking	Tata McGraw–Hill, New Delhi	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Larry L. Peterson, Bruce S. Davie	Computer Networks: A Systems Approach	Morgan Kaufmann Publishers Inc.,	2011
2.	James F. Kurose, Keith W. Ross	Computer Networking, A Top–Down Approach Featuring the Internet	Pearson Education	2012

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COMPUTER SCIENCE AND ENGINEERING

19CSC08 **COMPUTER NETWORKS LAB**

L	T	P	C
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COURSE OBJECTIVES:

1. To Learn a communicate between two desktop computers
2. Learn to implement the different protocols
3. To Be familiar with IP Configuration
4. To Be familiar with the various routing algorithms
5. To Be familiar with simulation tools in NS

COURSE OUTCOMES:

At the end of the course, the students will be able to

19CSC08.CO1	Demonstrate the Communication Error between two desktop computers
19CSC08.CO2	Select the different protocols in link-to-link level
19CSC08.CO3	Design a Program using sockets for command
19CSC08.CO4	Illustrate and compare the various routing algorithms
19CSC08.CO5	Use the simulation tool and code for classical Encryption Techniques

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC08.CO1	-	-	x	-	-	x	-	-	-	-	-	x	-	x	-
19CSC08.CO2	-	x	-	-	x	x	-	-	-	x	x	-	x	x	-
19CSC08.CO3	-	-	x	-	-	x	-	-	x	-	-	x	-	-	x
19CSC08.CO4	x	x	-	x	-	-	x	-	-	x	-	-	x	-	-
19CSC08.CO5	x	-	-	-	-	x	x	-	-	x	-	x	x	-	-

LIST OF PROGRAMS

. 1. Implementation of Error Detection / Error Correction Techniques

. 2. Implementation of Stop and Wait Protocol

. 3. Implementation of Sliding window Protocol

. 4. Implementation of Go Back NARQ

. 5. Implementation of Socket Programming, Echo, Ping Command and Talk Command

. 6. Implementation of Network Topology

. 7. Implementation of Distance Vector Routing Algorithm (RIP on Packet Tracer)

. 8. Implementation of Link State Routing Algorithm (OSPF on Packet Tracer)

9. Study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols
10. Implementation of High-Level Data Link Control
11. Study and Implementation of Network simulator (NS)
12. Implementation of Encryption and Decryption Algorithm

TOTAL: P : 30

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COMPUTER SCIENCE AND ENGINEERING

19CSC09 **OPERATING SYSTEMS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

1. Understand the Fundamental Concepts of Operating Systems
2. Analysis Threads and Scheduling Algorithm.
3. Summarize on Memory management that includes deadlock detection algorithms .
4. Examine the mechanisms involved in Storage management.
5. Illustrate different OS and compare their features.

COURSE OUTCOMES

At the end of the course, the students will be able to

19CSC09.CO1 Recall the basic architectural components involved in design an operating system.

19CSC09.CO2 Recognize the various scheduling algorithms for different types of operating system.

19CSC09.CO3 Construct resource management techniques and handling Deadlock issues.

19CSC09.CO4 Investigate to change the disk structure and access the files.

19CSC09.CO5 Integrate the different operating systems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC09.CO1	-	-	x	-	-	x	-	-	-	-	-	x	-	x	-
19CSC09.CO2	-	x	-	-	x	x	-	-	-	x	x	-	x	x	-
19CSC09.CO3	-	-	x	-	-	x	-	-	x	-	-	x	-	-	x
19CSC09.CO4	x	x	-	x	-	-	x	-	-	x	-	-	x	-	-
19CSC09.CO5	x	-	-	-	-	x	x	-	-	x	-	x	x	-	-

UNIT I OPERATING SYSTEMS OVERVIEW 9

Operating system functions, Operating system structure, operating systems Operations, protection and security, Computing Environments, Open- Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot. Processes: Process concept, process Scheduling, Operations on processes, Inter process Communication, Examples of IPC systems.

UNIT II THREADS AND SCHEDULING ALGORITHMS 9

Multicore Programming, Multithreading Models, Thread Libraries, Threading Issues. Process Synchronization: The critical-section problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors, Synchronization examples, Alternative approaches. CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling, Multiple Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation

UNIT III MEMORY MANAGEMENT 9

Swapping, contiguous memory allocation, segmentation, paging, structure of the page table. Virtual memory: demand paging, page-replacement, Allocation of frames, Thrashing, Memory Mapped Files, Allocating Kernel Memory Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

UNIT IV STORAGE AND FILE MANAGEMENT 9

Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation. File system Interface: The concept of a file, Access Methods, Directory and Disk structure, File system mounting, File sharing, Protection. File system Implementation: File-system structure, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space management..

UNIT V CASE STUDY – LINUX SYSTEM 9

Linux System- Basic Concepts; System Administration-Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization- Basic Concepts, Setting Up Xen, VMware on Linux Host and Adding Guest OS.

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Abrham Silberchatz, Peter B. Galvin, Greg Gagne	Operating System Concepts	Wiley,9th Edition	2014
2.	William. Stallings	Operating Systems – internals and Design Principles	Pearson,7th Edition	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Andrew S Tanenbaum,	Modern Operating Systems	PHI, Second Edition	2009
2.	D M Dhamdhere	Operating Systems: A Concept-Based Approach	Tata Mc-graw Hill Publishing3rd Edition	2012
3.	Charles Crowley	Operating System: A Design-Oriented A pproach	Tata Mc-graw Hill Publishing 1ST edition	2009
4.	Evi Nemeth , Garth Snyder, Trent R. Hein , Ben Whaley , Dan Mackin	UNIX and Linux System Administration Handbook	Prentice Hall of India, 4th Edition	2010
5.	Harvey M. Deitel	Operating Systems	Pearson Education, 3rd Edition.	2007

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COMPUTER SCIENCE AND ENGINEERING

19CSC10	OPERATING SYSTEMS LAB	L	T	P	C
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Course Objectives:

1. Remember programs in Linux environment using system call.
2. Understand the scheduling algorithms.
3. Apply page replacement algorithms.
4. Analyze file allocation methods.
5. Create and implement IPC mechanism using named and unnamed pipes.

Course Outcomes:

At the end of the course, the students will able to

19CSC10.CO1	Enumerate to develop application programs using system calls in Unix.
19CSC10.CO2	Estimate interprosses communication between two processes.
19CSC10.CO3	Develop and solve synchronization problems.
19CSC10.CO4	Analyze to simulate operating system concepts such as scheduling, deadlock management, file management, and memory management.
19CSC10.CO5	Integrate to develop application programs using system calls in Unix.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC10.CO1	-	-	X	-	-	X	-	-	-	-	-	X	-	X	-
19CSC10.CO2	-	X	-	-	x	X	-	-	-	X	x	-	X	x	-
19CSC10.CO3	-	-	X	-	-	X	-	-	X	-	-	X	-	-	X
19CSC10.CO4	X	X	-	X	-	-	X	-	-	X	-	-	X	-	-
19CSC10.CO5	X	-	-	-	-	X	X	-	-	X	-	X	X	-	-

LIST OF PROGRAMS

1. Basics of Unix Commands
2. Write C programs to simulate the following CPU scheduling algorithms: a) Round Robin b) SJF
3. Write C programs to simulate the following CPU scheduling algorithms: a) FCFS b) Priority.
4. Write a C program to copy the contents of one file to another using system calls.
5 Write a C program to simulate Bankers Algorithm for Dead Lock Avoidance
6. Write a C program to simulate Bankers Algorithm for Dead Lock Prevention
7 Write C programs to simulate the following page replacement algorithms: a) FIFO b) LRU c) LFU
8. Write C programs to simulate the following techniques of memory management: a) Paging b) Segmentation
9. Write a C program to implement the ls | sort command. (Use unnamed Pipe)

10. Write a C program to solve the Dining- Philosopher problem using semaphores.

11. Write C programs to simulate the following File organization techniques: a) Single level directory b) Two level

c) Hierarchical

12. Write C programs to simulate the following File allocation methods: a) Contiguous b) Linked c) Indexed

TOTAL:P : 30

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COMPUTER SCIENCE AND ENGINEERING

19CSC11 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

1. Introduce various Mathematical techniques for representation and manipulation of the data in the real world.
2. Expose students to a variety of technique for designing and analyzing algorithms
3. Summarize the choice of Data Structures and algorithms by designing the performance of programs
4. Formulate the time order analysis for an algorithm to prove the correctness of an algorithm
5. To understand the differences between tractable and intractable problems.

COURSE OUTCOMES

At the end of the course, the students will able to

19CSC11.CO1 Identify algorithm design methodology to solve problems.
19CSC11.CO2 Analyze the algorithm efficiency by means of mathematical Notations
19CSC11.CO3 Empathize the limitation of Computations
19CSC11.CO4 Design algorithms for network flows
19CSC11.CO5 Differentiate algorithm design techniques of P and NP classes of problems

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC11.CO1	x	x	x	x	x	x	x	-	x	-	x	x	x	x	x
19CSC11.CO2	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x
19CSC11.CO3	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x
19CSC11.CO4	x	x	x	x	x	x	x	-	-	x	x	x	x	x	x
19CSC11.CO5	x	x	x	x	x	x	x	-	-	-	x	x	x	x	x

UNIT I INTRODUCTION 9

Introduction-Algorithm definition, Algorithm Specification, Performance Analysis-Space complexity, Time complexity, Randomized Algorithms. Divide and conquer- General method, applications - Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication.

UNIT II BACKTRACKING 9

Disjoint set operations, union and find algorithms, AND/OR graphs, Connected Components and Spanning trees, Bi-connected components, Backtracking-General method, applications-The 8-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT III GREEDY METHOD 9

Greedy method- General method, applications- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem.

UNIT IV DYNAMIC PROGRAMMING 9

Dynamic Programming- General Method, applications- Chained matrix multiplication, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack problem, Reliability design, Traveling sales person problem.

UNIT V BRANCH AND BOUND & NP-HARD, NP-COMPLETE PROBLEMS 9

Branch and Bound- General Method, applications-0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution, Traveling sales person problem.NP-Hard and NP-Complete problems- Basic concepts, Non-deterministic algorithms, NP -Hard and NP- Complete classes, Cook's theorem.

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ellis Horowitz, SartajSahni and S. Rajasekharan	Fundamentals of Computer Algorithms, 2nd Edition	Universities Press	2008
2.	P. H. Dave	Design and Analysis of Algorithms	H.B.Dave,2nd edition, Pearson Education	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	M. T. Goodrich and R. Tomassia	Algorithm Design: Foundations, Analysis and Internet examples	John Wiley and sons	2006
2.	S. Sridhar	Design and Analysis of Algorithms	Oxford Univ. Press	2014
3.	Aho, Ullman and Hopcroft	Design and Analysis of algorithms	Pearson Education	1974
4.	R. Neapolitan and K. Naimipour	Foundations of Algorithms	4th edition,Jones and Bartlett Student edition	2011
5.	T. H. Cormen, C. E.Leiserson, R. L. Rivest and C. Stein	Introduction to Algorithms	PHI,3rd Edition	2009

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COMPUTER SCIENCE AND ENGINEERING

19CSC12 **SOFTWARE ENGINEERING**

L	T	P	C
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COURSE OBJECTIVES :

1. To Understand the software life cycle models
2. Learn Requirement analysis and fundamental concepts
3. Understand the various software design methodologies
4. Acquire knowledge on Software testing and risk management
5. Apply different techniques to measure software performance

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC12.CO1 Apply the concepts of life cycle models to choose the appropriate model.
19CSC12.CO2 Analysis the requirements and design the software.
19CSC12.CO3 Construct a design for a real-world problem.
19CSC12.CO4 Design and develop test cases.
19CSC12.CO5 Work with version control and work on configuration and release management plans

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC12.CO1	x	-	-	-	x	-	-	x	-	-	-	-	-	-	x
19CSC12.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19CSC12.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19CSC12.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19CSC12.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile process-Extreme programming-XP Process.

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management Classical analysis: Structured system Analysis, Petri Nets-Data Dictionary.

UNIT III SOFTWARE DESIGN 9

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNIT IV TESTING AND IMPLEMENTATION 9

Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging – Software Implementation Techniques: Coding practices-Refactoring.

UNIT V PROJECT MANAGEMENT 9

Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO Model I,II - Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM - Scheduling and Tracking –Relationship between people and effort, Task Set & Network, Scheduling, EVA - Process and Project Metrics.

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Roger S.Pressman	Software Engineering – A Practitioner`s Approach	7th Edition McGraw-Hill Education	2010
2.	Pankaj Jalote	Software Engineering- A Precise Approach	Wiley India	2010
3.	Sommerville	Software Engineering	9th edition, Pearson education	2001

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	K. K. Agarval, Yogesh Singh	Software Engineering	3rd edition, New Age International Publishers	2007
2.	Lames F. Peters, Witold Pedrycz	Software Engineering an Engineering approach	John Wiely & Sons	2000
3.	Shely Cashman Rosenblatt	Systems Analysis and Design	6th edition, Thomson, Publications	2006
4.	Ali Behforooz and Frederick J Hudson	Software Engineering Fundamentals	Oxford University Press, New Delhi,	1996
5.	Sheikh Umar Farooq, S. M. K Quadri and Nesar Ahmad	Software Testing Techniques Evaluation – An Empirical Approach	Lambert Academic Publishing, Germany,	Dec 2012 (ISBN: 978-3-659-19538-9)

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COMPUTER SCIENCE AND ENGINEERING

19CSC13 **SERVICE ORIENTED ARCHITECTURE**

L	T	P	C
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COURSE OBJECTIVES :

1. Provide a foundation upon which all technologies and strategies around XML are based.
2. Analysis the tools and techniques needed to make use of XML in a robust manner
3. Understand the basic concepts of SOA, comparison with older architectures and principles of service orientation and different service layers of SOA.
4. Illustrate about web services, messaging with SOAP and to learn about advanced concepts such as Orchestration and Choreography
5. Describe about various WS-* specification standards

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC13.CO1 Design the XML based application to transfer and store the data in network application.
19CSC13.CO2 Evaluate the XML document with the help of parsing, DOM and XSLT.
19CSC13.CO3 Creation of service based program and SOA features to design client server program.
19CSC13.CO4 Develop web services and web programs with SOAP, WSDL and UDDI.
19CSC13.CO5 Building SOA-Based Applications with J2EE, .Net and ASP.Net technologies.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC13.CO1	-	-	x	x	x	-	-	x	-	-	x	-	x	-	-
19CSC13.CO2	x	-	x	x	x	-	x	-	-	-	x	-	-	-	x
19CSC13.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19CSC13.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19CSC13.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT I XML INTRODUCTION 9

XML document structure –Elements - Well formed and valid documents – Namespaces – DTD – XML Schema X-Files-XML Query – XML link –XML path.

UNIT II BUILDING XML - BASED APPLICATIONS 9

Parsing XML – using DOM, - XML Tree – XML Attributes - SAX – XML Transformation and XSLT – XSL Formatting – Modeling Databases in XML.

UNIT III SERVICE ORIENTED ARCHITECTURE 9

Roots of SOA - Characteristics of SOA - Comparing SOA with Client-Server and Distributed architectures – Benefits of SOA - Principles of Service orientation – Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer- Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation

UNIT IV WEB SERVICES 9

Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Message Exchange Patterns – Coordination –Atomic Transactions – Business activities - Orchestration – Choreography –WS Transactions.

UNIT V BUILDING SOA-BASED APPLICATIONS 9

Service Oriented Analysis and Design – Service Modeling – Design standards and guidelines - Composition – WS-BPEL – WS-Coordination – WS-Policy – WS-Security – SOA support in J2EE - SOA support in .NET - ASP.NET web forms – ASP.NET web services.

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ron Schmelzer et al	XML and Web Services	Pearson Education	2002
2.	Thomas Erl	Service Oriented Architecture: Concepts, Technology, and Design	Pearson Education	2005

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Frank P.Coyle	XML, Web Services and the Data Revolution	Pearson Education	2002
2.	Eric Newcomer, Greg Lomow	Understanding SOA with Web Services	Pearson Education	2005
3.	Sandeep Chatterjee , James Webber	Developing Enterprise Web Services: An Architect's Guide	Prentice Hall	2004
4.	James McGovern,Sameer Tyagi, Michael E.Stevens, Sunil Mathew	Java Web. Services Architecture	Morgan Kaufmann Publishers	2003
5.	Dmitri Ilkaev, Art Sedighi	SOA eBook Patterns, Mashups, Governance, Service Modeling, and More	Pearson Education	2009

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COMPUTER SCIENCE AND ENGINEERING

19CSC14 **MOBILE COMMUNICATION** **L T P C**

3 0 0 3

COURSE OBJECTIVES :

1. Understand the fundamentals of mobile communication
2. Apply the typical mobile networking infrastructure through a popular GSM protocol
3. Summarize the basics of mobile telecommunication system.
4. Identify the Mobile Network Layer Functionalities of Mobile communication.
5. Define the functions of Transport and Application layers

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC14.CO1 State the basics of mobile telecommunication system

19CSC14.CO2 Illustrate the generations of telecommunication systems in wireless network

19CSC14.CO3 Understand the architectures, the challenges and the Solutions of Wireless Communication

19CSC14.CO4 Identify solution for each functionality at each layer

19CSC14.CO5 Analyze the functionality of Transport and Application layer

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC14.CO1	-	-	X	-	-	X	-	-	-	-	-	X	-	X	-
19CSC14.CO2	-	X	-	-	x	X	-	-	-	X	x	-	X	x	-
19CSC14.CO3	-	-	X	-	-	X	-	-	X	-	-	X	-	-	X
19CSC14.CO4	X	X	-	X	-	-	X	-	-	X	-	-	X	-	-
19CSC14.CO5	X	-	-	-	-	X	X	-	-	X	-	X	X	-	-

UNIT I WIRELESS COMMUNICATION FUNDAMENTALS 9

Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks.

UNIT II TELECOMMUNICATION NETWORKS 11

Telecommunication systems – GSM – GPRS – DECT – Satellite Networks - Basics – Parameters and Configurations – Capacity Allocation – FAMA and DAMA – Broadcast Systems – DAB - DVB.

UNIT III WIRELESS LAN 9

Wireless LAN – IEEE 802.11 - Architecture – services – MAC – Physical layer – IEEE 802.11a - HIPERLAN – Blue Tooth.

UNIT IV MOBILE NETWORK LAYER 9

Mobile IP – Dynamic Host Configuration Protocol - Routing – DSDV – DSR – Alternative Metrics.

UNIT V TRANSPORT AND APPLICATION LAYERS 7

Traditional TCP – Classical TCP improvements – WAP- Introduction to 4G mobile networks- Case study – Mobile multimedia networks.

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jochen Schiller	Mobile Communications	PHI/Pearson Education.Second Edition	2003
2.	William Stallings	Wireless Communications and Networks	PHI/Pearson Education	2002

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kaveh Pahlavan, Prasanth Krishnamoorthy	Principles of Wireless Networks	PHI/Pearson Education	2003
2.	Uwe Hansmann, Lothar Merk, Martin S, Nicklons and Thomas Stober	Principles of Mobile Computing	Springer, New York	2003
3.	Hazysztof Wesolowshi	Mobile Communication Systems	John Wiley and Sons Ltd	2002

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COMPUTER SCIENCE AND ENGINEERING

19CSC15	MOBILE APPLICATION LAB	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1.Apply the fundamental design paradigms and technologies to mobile computing applications

2. Design consumer and enterprise mobile applications using representative mobile devices and platforms using modern development methodologies.

3.Implement the skills of finding solutions and building software for mobile computing applications

4. Discuss wireless communication and networking principles, which support connectivity to cellular networks, wireless internet and sensor devices.

5. Classify user Interfaces for the Android platform.

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC15.CO1	Understand the characteristics and limitations of mobile hardware devices including their user-interface modalities.
19CSC15.CO2	The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.
19CSC15.CO3	A comprehension of the design of context-aware solutions for mobile devices.
19CSC15.CO4	Develop various Android applications related to layouts & rich uses interactive interfaces
19CSC15.CO5	Illustrate the Mobile Network performance parameters and design decisions.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC15.CO1	-	-	x	-	-	x	-	-	-	-	-	x	-	x	-
19CSC15.CO2	-	x	-	-	x	x	-	-	-	x	x	-	x	x	-
19CSC15.CO3	-	-	x	-	-	x	-	-	x	-	-	x	-	-	x
19CSC15.CO4	x	x	-	x	-	-	x	-	-	x	-	-	x	-	-
19CSC15.CO5	x	-	-	-	-	x	x	-	-	x	-	x	x	-	-

LIST OF PROGRAMS

1. Study of WML and J2ME simulators
2. Design of simple Calculator having +,,,* and / using WML/J2ME
3. Design of Calendar for any given month and year using WML/J2ME
4. Design a Timer to System Time using WML/J2ME
5. Design of simple game using WML/J2ME
6. Animate an image using WML/J2ME
7. Design a personal phone book containing the name, phone no., address, e-mail, etc
8. Simulation of Authentication and encryption technique used in GSM

9. Browsing the Internet using Mobile phone simulator
10. Study of GlomoSim Simulator

TOTAL:P : 30

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COMPUTER SCIENCE AND ENGINEERING

19CSC16 **DATA ANALYTICS USING R AND PYTHON**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES :

1. Understand the important keywords in R like Business Intelligence, Business Analytics
2. Analysis the sample of a dirty data set and perform Data Cleaning on it, resulting in a data set, which is ready for any analysis
3. Apply the basic concepts of clustering techniques in real time application
4. Implement the Practical Data Science Using Python
5. Construct using Numpy, pandas and Jupyter Notebook environment for writing, testing, and debugging Python code

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC16.CO1	Understand the basics in R programming in terms of constructs, control statements, string functions
19CSC16.CO2	Apply critical programming language concepts such as data types, iteration, control structures, functions, and boolean operators
19CSC16.CO3	Implement a variety of data formats into R using RStudio
19CSC16.CO4	Analyze a data set in numpy and pandas
19CSC16.CO5	Visualize data attributes using matplotlib and other R packages

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC16.CO1	x	x	-	-	-	-	-	-	-	-	-	-	x	x	-
19CSC16.CO2	x	-	x	-	x	-	-	-	-	-	-	x	-	-	-
19CSC16.CO3	x	-	-	x	x	-	-	-	-	-	-	-	-	x	-
19CSC16.CO4	-	x	x	x	x	-	-	-	x	-	-	x	-	x	x
19CSC16.CO5	-	x	x	x	x	-	-	-	x	-	-	x	x	-	x

UNIT I INTRODUCTION TO DATA ANALYTICS 9

Introduction to terms like Business Intelligence, Business Analytics, Data, Information, how information hierarchy can be improved/introduced, understanding Business Analytics and R, knowledge about the R language, its community and ecosystem, understand the use of 'R' in the industry, compare R with other software in analytics, , perform basic operations in R using command line, learn the use of IDE R Studio and Various GUI, use the 'R help' feature in R, knowledge about the worldwide R community collaboration.

UNIT II DATA MANIPULATION IN R 9

Import data from spreadsheets and text files into R, import data from other statistical formats like sas7bdat and spss, packages installation used for database import, connect to RDBMS from R using ODBC and basic SQL queries in R, basics of Web Scraping.

UNIT III CLUSTERING TECHNIQUES 9

The Matplotlib 2D plotting library Understanding the shell, Using Git and GitHub, Best-practice software engineering techniques, Nlp, Recommended System

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UNIT IV INTRODUCTION TO NUMPY PANDAS 9

Python 3.5,The Numpy package for scientific computing, The pandas data analysis library, including reading and writing of CSVfiles,The Juypter and PyDev development environments.

UNIT V APPLICATION OF PYTHON 9

The Matplot lib 2D plotting library Understanding the shell, Using Git and GitHub, Best-practice software engineering techniques, Nlp, Recommended System.

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gareth James,Daniela Written	An introduction to statistical learning with application R	Springer	2019
2.	Mark Lutz, O'Reilly Media	Learning Python	ISBN 978-1-4493-5573-9	5th Edition, 2013
3.	Gareth James,Daniela Written	An introduction to statistical learning with application R	Springer	2019

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	KOSUKE IMAI	Quantitative social science an Introduction	Springer	2017
2.	by Wes McKinny, O'Reilly Media	Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython	ISBN 978-1-4493-1979-3	2012
3.	Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar,	Introduction to Parallel Computing	Pearson; 2 edition ISBN 978	January 26, 2003
4.	Nathan Marz, James Warren	Principles and best practices of scalable real-time data systems	1st Edition, , ISBN 978	2017
5.	Bharti Motwani	Data Analytics with R	Kindle Edition	1 January 2019

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COMPUTER SCIENCE AND ENGINEERING

19CSC17 **THEORY OF COMPUTATION** **L T P C**

3 0 0 3

COURSE OBJECTIVES :

1. Introduce the models of Finite Automata.
2. Describe about types of Grammar and its properties.
3. Demonstrate the conversion of Context Free Grammars in to CNF and GNF.
4. Provide an overview of Pushdown automata
5. Discuss about the implementation of Turing machines.

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC17.CO1 Design Finite Automata using its theoretical concept.

19CSC17.CO2 Convert Regular expressions to FA and minimize Automata.

19CSC17.CO3 Simplify CFG to CNF and GNF

19CSC17.CO4 Design PDA for the Given Grammar.

19CSC17.CO5 Construct Turing Machine for given grammar

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC17.CO1	x	x	x	-	-	-	-	-	-		-		x	x	-
19CSC17.CO2	x	x	-	-	x	-	-	-	-	-	-	-	x	x	-
19CSC17.CO3	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
19CSC17.CO4	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
19CSC17.CO5	-	x	x	-	-	-	-	x	-	-	-	-	x	x	-

UNIT I FINITE AUTOMATA 9

Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA &NDFA– Finite Automaton with ϵ- moves — Equivalence of NFA and DFA – Equivalence of NDFA's with and without ϵ-moves – Minimization of DFA.

UNIT II REGULAR EXPRESSIONS AND LANGUAGES 9

Chomsky hierarchy of languages. -Types of Grammar -Regular Expression – Proving languages not to be regular – Problems based on Pumping Lemma-Equivalence of Finite Automaton and Regular expressions -Minimization of FA-Pumping Lemma for Regular sets –Closure Properties of Regular Languages.

UNIT III CONTEXT-FREE GRAMMAR AND LANGUAGES 9

Grammar Introduction–Context Free Grammars and Languages– Derivations -Parse Trees – Ambiguity – Simplification of CFG – Elimination of Useless symbols - Unit productions – Null productions – Greiback Normal form –Chomsky normal form – Problems related to CNF and GNF.

UNIT IV PUSHDOWN AUTOMATA 9

Pushdown Automata- Definitions – Moves – Instantaneous descriptions – Deterministic and Non- Deterministic pushdown automata – Equivalence of Pushdown automata and CFG - Pumping lemma for CFL – Problems based on pumping Lemma. Closure Properties of CFL.

UNIT V TURING MACHINES & UNDECIDABILITY 9

Turing machines: Models –Techniques for TM construction – Multi head and Multi tape Turing Machines -Universal Turing machine – Problems on Turing machine. Recursive and recursively enumerable languages-The Halting Problem –An undecidable problem that is RE – Undecidable problems about Turing Machine-.Post's Correspondence Problem - The classes P and NP Problems.

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hopcroft J.E., Motwani R. and Ullman J.D	Introduction to Automata Theory, Languages and Computations	Pearson Education Second Edition	2008
2.	John C Martin	Introduction to Languages and the Theory of Computation	Tata McGraw Hill Publishing Company Third Edition	2007

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mishra K L P and Chandrasekaran N	Theory of Computer Science - Automata, Languages and Computation	Prentice Hall of India Third Edition	2004
2.	Harry R Lewis and Christos H Papadimitriou	Elements of the Theory of Computation	Prentice Hall of India, Pearson Education Second	2003
3.	Peter Linz	An Introduction to Formal Language and Automata	Narosa Publishers	2002
4.	Kamala Krithivasan and Rama. R	Introduction to Formal Languages, Automata Theory and Computation	Pearson Education	2009
5.	Wayne Goddard	Introducing the Theory of Computation	Clemson University	2008

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COMPUTER SCIENCE AND ENGINEERING

19CSC18 **CLOUD COMPUTING**

L	T	P	C
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COURSE OBJECTIVES:

1. Describe three cloud deployment models, and Overview of AWS Global infrastructure.
2. Understand the different AWS core services.
3. Formulate virtual firewalls with security groups.
4. Review the availability differences of alternative database solutions.
5. Summarize the AWS Shared Responsibility Model, Examine IAM users, groups, and roles.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSC18.CO1 Construct three cloud deployment models, and Overview of AWS Global infrastructure.

19CSC18.CO2 Implement the different AWS compute services.

19CSC18.CO3 Create virtual firewalls with security groups.

19CSC18.CO4 Construct the availability of different alternative database solutions.

19CSC18.CO5 Implement AWS Shared Responsibility Model, Examine IAM users, groups, and roles.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC18.CO1	x	x	x	-	-	-	-	-	-		-		x	x	-
19CSC18.CO2	x	x	-	-	x	-	-	-	-	-	-	-	x	x	-
19CSC18.CO3	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
19CSC18.CO4	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
19CSC18.CO5	-	x	x	-	-	-	-	x	-	-	-	-	x	x	-

UNIT I CLOUD CONCEPTS 9

Cloud Concepts Overview - Introduction to Cloud Computing, Advantages of Cloud Computing, CC Reference Model, Introduction to Amazon Web Services (AWS), AWS Cloud Adoption Framework (CAF). Cloud Economics - Fundamentals of Pricing, Total Cost of Ownership, AWS Global Infrastructure Overview - AWS Global Infrastructure, AWS Service and Service Category Overview.

UNIT II AWS CORE SERVICES 9

Compute - Compute Services Overview, Introduction to Amazon Elastic Compute Cloud (EC2), Amazon EC2 Cost Optimization, Introduction to AWS Lambda, Introduction to AWS Elastic Beanstalk. Storage - Amazon Elastic Block Store (EBS), Amazon Simple Storage Service (S3), Amazon Elastic File System (EFS), Amazon Glacier. VPC - Amazon Virtual Private Cloud (VPC), Amazon VPC Security Groups, Amazon CloudFront,. Database - Amazon Relational Database Service (RDS), Amazon DynamoDB, Amazon Redshift, Amazon Aurora. Balancing, Scaling, Monitoring - Elastic Load Balancing (ELB), Amazon CloudWatch, Auto Scaling.

UNIT III CLOUD SECURITY 9

AWS Shared Responsibility Model, AWS Identity and Access Management (IAM), AWS Trusted Advisor, AWS CloudTrail, AWS Config, AWS Day One Best Practice Review, AWS Security and Compliance

Programs, AWS Security Resources.

UNIT IV CLOUD ARCHITECTING 9

Introduction to the Well-Architected Framework, Well-Architected Design Principles, Understanding Reliability and High Availability.

UNIT V CLOUD SUPPORT 9

Introduction to AWS Organizations, AWS Cost Explorer, Overview of AWS Technical Support Plans and Costs, Microsoft azure, Google app Engine.

TOTAL :L: 45

TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kai Hwang, Geoffrey C Fox, Jack G Dongarra	Distributed and Cloud Computing From Parallel Processing to the Internet of Things	Morgan Kaufmann Publishers	2012
2.	Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi	Mastering Cloud Computing	Tata McGraw Hill	2013

REFERENCE BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	John W.Rittinghouse and James F.Ransome	Cloud Computing: Implementation, Management, and Security	CRC Press	2010
2.	Bernard Golden	Amazon Web Service For Dummies	John Wiley & Sons, Inc	2013
3.	Mitch Tulloch with the Windows Azure Team	Introducing Windows Azure	Microsoft Press	2013
4.	Barrie Sosinsky	Cloud Computing Bible	Wiley India	2015
5.	Gautam Shroff	Enterprise Cloud Computing	Cambridge	2010

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COMPUTER SCIENCE AND ENGINEERING

19CSC19	CLOUD COMPUTING LAB	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1.To understand and study Amazon EC2

2. To work with EBS.

3.To build VPC, web server and DB server

4.To build the DB Server.

5.To construct scale and load balance of cloud architecture.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSC19.CO1 Construct Amazon EC2

19CSC19.CO2 Examine with EBS

19CSC19.CO3 Develop VPC, web server and DB server

19CSC19.CO4 Assemble DB Server.

19CSC19.CO5 Implement scale and load balance of cloud architecture.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC19.CO1	x	x	x	-	-	-	-	-	-	x	-		x	x	-
19CSC19.CO2	x	x	-	-	x	-	x	-	-	-	-	-	x	x	-
19CSC19.CO3	x	x	x	-	-	-	-	-	-	x	-	-	-	x	x
19CSC19.CO4	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
19CSC19.CO5	-	x	x	-	-	-	-	x	-	-	-	-	x	x	-

LIST OF PROGRAMS

1. Introduction to Amazon EC2
2. Working with EBS
3. Build VPC and Launch a Web Server
4. Build DB Server and Interact with DB Using an App
5. Scale and Load Balance Architecture
6. Introduction to AWS IAM
7. Sandbox.
8. Use GAE launcher to launch the web applications.
9. Simulate a Cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
10. Install Hadoop single node cluster and run simple applications like word count.

TOTAL:P : 30

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COMPUTER SCIENCE AND ENGINEERING

19CSC20 **COMPILER DESIGN** **L T P C**

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Course Objectives :

1. To understand the basic concepts of compilers.
2. To explore the functions of Lexical Analyzer.
3. Be familiar with various parsing techniques.
4. To describe the process of Syntax directed translation and Intermediate Code Generation.
5. To learn the concepts of Code Generation and Code Optimization

Course Outcomes :

At the end of the course, the students will able to

19CSC20.CO1	Construct the various phases of compiler using compiler construction tools
19CSC20.CO2	Design a lexical analyzer using LEX language
19CSC20.CO3	Apply different parsing algorithms to develop parser for a grammar
19CSC20.CO4	Generate the Intermediate Languages for code generation
19CSC20.CO5	Implement code generation schemes and optimized compilers

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC20.CO1	x	-	-	-	-	-	x	x	-	x	-	x	x	-	-
19CSC20.CO2	-	-	x	-	x	x	-	x	x	x	-	-	x	-	x
19CSC20.CO3	-	x	-	-	-	x	x	-	-	-	x	x	-	x	-
19CSC20.CO4	x	-	x	x	x	-	-	-	x	-	x	-	x	-	x
19CSC20.CO5	x	x	x	x	-	-	-	-	x	-	-	x	x	x	-

UNIT I INTRODUCTION TO COMPILERS 7

Translators-Compilation and Interpretation-Language processors -The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools.

UNIT II LEXICAL ANALYSIS 9

Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language.

UNIT III SYNTAX ANALYSIS 10

Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies-Recursive Descent Parser, Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser -LR(0) Item Construction of SLR Parsing Table - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language .

UNIT IV SYNTAX DIRECTED TRANSLATION & INTERMEDIATE CODE GENERATION 9

Syntax directed Definitions- Run-Time Environments- Storage Organization-Storage Allocation Strategies. Intermediate Code Generation – Intermediate languages – Declarations – Assignment Statements-Boolean expressions – Case statements- Backpatching - Procedure calls.

UNIT V CODE OPTIMIZATION AND CODE GENERATION 10

Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Issues in Design of a Code Generator - A Simple Code Generator Algorithm. Case Study: Single pass and two pass compilers.

TOTAL:L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman	Compilers – Principles, Techniques and Tools	Pearson Education	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Randy Allen, Ken Kennedy	Optimizing Compilers for Modern Architectures: A Dependence-based Approach	Morgan Kaufmann Publishers	2002
2.	Steven S. Muchnick	Advanced Compiler Design and Implementation	Morgan Kaufmann Publishers	2003
3.	Keith D Cooper and Linda Torczon	Engineering a Compiler	Elsevier Science	2004
4.	Charles N. Fischer, Richard. J. LeBlanc	Crafting a Compiler with C	Crafting a Compiler with C	2008

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COMPUTER SCIENCE AND ENGINEERING

19CSC21 **COMPILER DESIGN LAB** **L T P C**
0 0 2 1

COURSE OBJECTIVES :

1. To study and understand Lexical Analyzer using Lex tool & Syntax Analyzer or parser using YACC Tool
2. To implement NFA and DFA from a given regular expression
3. To design front end of the compiler by means of generating Intermediate codes.
4. To construct symbol table.
5. To apply code optimization techniques.

COURSE OBJECTIVES :

At the end of the course, the students will able to

19CSC21.CO1 Design Lexical analyzer for given language using C and LEX tools.

19CSC21.CO2 Convert BNF rules into YACC form to generate various parsers.

19CSC21.CO3 Generate machine code from the intermediate code forms

19CSC21.CO4 Evaluate the Symbol table

19CSC21.CO5 Implement code optimization techniques.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC21.CO1	x	-	-	-	-	-	x	x	-	x	-	x	x	-	-
19CSC21.CO2	-	-	x	-	x	x	-	x	x	x	-	-	x	-	x
19CSC21.CO3	-	x	-	-	-	x	x	-	-	-	x	x	-	x	-
19CSC21.CO4	x	-	x	x	x	-	-	-	x	-	x	-	x	-	x
19CSC21.CO5	x	x	x	x	-	-	-	-	x	-	-	x	x	x	-

LIST OF PROGRAMS

1. Construction of NFA.
2. Construction of minimized DFA from a given regular expression.
3. Use LEX tool to implement a lexical analyzer.
4. Use YACC and LEX to implement a parser for the grammar.
5. Implement a recursive descent parser for an expression grammar that generates arithmetic expressions with digits, + and *.
6. Implementation of symbol table
7. Implementation of shift reduced parsing algorithms.

8. Construction of LR parsing table.
9. Generation of code for a given intermediate code.
10. Implementation of code optimization techniques.

TOTAL:P : 30

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COMPUTER SCIENCE AND ENGINEERING

19CSC22 ARTIFICIAL INTELLIGENCE FOR INDUSTRY 4.0

L	T	P	C
3	0	0	3

COURSE OBJECTIVES :

1 Align the theory and concepts with Industrial application of computers
2 Introduce the basic concepts of Industry 4.0
3. To gather knowledge about Big Data and Internet of Things.
4. Learn the applications and tools of Industry 4.0
5. To equip the skills for future.

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC22.CO1 Understand the basic concepts of Industry 4.0
19CSC22.CO2 Outline the features of Artificial Intelligence
19CSC22.CO3 Summarize the Big data domain stack and Internet of Things
19CSC22.CO4 Identify the applications and Tools of Industry 4.0
19CSC22.CO5 Analyze the skills required for future

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC22.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19CSC22.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19CSC22.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19CSC22.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19CSC22.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT I INDUSTRY 4.0 9

Need – Reason for Adopting Industry 4.0 - Definition – Goals and Design Principles - Technologies of Industry 4.0 – Big Data – Artificial Intelligence (AI) – Industrial Internet of Things - Cyber Security – Cloud – Augmented Reality.

UNIT II ARTIFICIAL INTELLIGENCE 9

Artificial Intelligence: Artificial Intelligence (AI) – What & Why? - History of AI - Foundations of AI -The AI - Environment - Societal Influences of AI - Application Domains and Tools - Associated Technologies of AI - Future Prospects of AI - Challenges of AI.

UNIT III BIG DATA AND IOT 9

Big Data : Evolution - Data Evolution - Data : Terminologies - Big Data Definitions - Essential of Big Data in Industry 4.0 - Big Data Merits and Advantages - Big Data Components : Big Data Characteristics - Big Data Processing Frameworks - Big Data Applications - Big Data Tools - Big Data Domain Stack : Big Data in Data Science - Big Data in IoT - Big Data in Machine Learning - Big Data in Databases - Big Data Use cases : Big Data in Social Causes - Big Data for Industry - Big Data Roles and Skills - Big Data Roles - Learning Platforms; Internet of Things (IoT) : Introduction to IoT - Architecture of IoT - Technologies for IoT - Developing IoT Applications - Applications of IoT - Security in IoT.

UNIT IV APPLICATIONS AND TOOLS OF INDUSTRY 4.0 9

Applications of IoT – Manufacturing – Healthcare – Education – Aerospace and Defence – Agriculture – Transportation and Logistics – Impact of Industry 4.0 on Society: Impact on Business, Government, People. Tools for Artificial Intelligence, Big Data and Data Analytics, Virtual Reality, Augmented Reality, IoT, Robotics.

UNIT V JOBS 2030 9

Industry 4.0 – Education 4.0 – Curriculum 4.0 – Faculty 4.0 – Skills required for Future - Tools for Education – Artificial Intelligence Jobs in 2030 – Jobs 2030 - Framework for aligning Education with Industry 4.0.

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	P. Kaliraj, T. Devi,	Higher Education for Industry 4.0 and Transformation to Education 5.0		
2.	Alexiei Dingli Foaad Haddod Christina Klüver	Artificial Intelligence in Industry 4.0	First Edition Springer International Publishing	2021

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Alasdair Gilchrist	Industry 4.0: The Industrial Internet of Things	Apress Publications	2017
2.	Prof.SudipMisra	Introduction to Industry 4.0 and Industrial Internet of Things		

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COMPUTER SCIENCE AND ENGINEERING

19CSC23 OBJECT ORIENTED ANALYSIS AND DESIGN

L	T	P	C
3	0	0	3

COURSE OBJECTIVES :

1. Understand the basic concepts of Object Oriented Systems Development
2. Describe how objects change over time.
3. Simplify a pattern using generalization and abstract classes.
4. Validate the UML Interaction diagrams drawn
5. Implementing object mapping to database system

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC23.CO1 Analyze the requirements through Unified approach
19CSC23.CO2 Identify the objects, relationships, services and attributes through UML.
19CSC23.CO3 Design the real time application by using General Responsibility Assignment Software Patterns
19CSC23.CO4 Relate class diagrams to equivalent program outlines.
19CSC23.CO5 Develop an appropriate test design for a given test object

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC23.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19CSC23.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19CSC23.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19CSC23.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19CSC23.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT I INTRODUCTION TO OOAD 9

An Overview of Object Oriented Systems Development - Object Basics- object oriented methodologies -Rumbaugh Methodology - Booch Methodology - Jacobson Methodology - Patterns -Frameworks - Unified Approach- Unified Modeling Language

UNIT II OBJECT ORIENTED ANALYSIS 9

Identifying use cases - Object Analysis - Classification - Identifying Object relationships - Attributes and Methods. Elaboration - Domain Models - Finding conceptual classes and description classes -Associations - Domain model refinement - Aggregation and Composition- UML activity diagrams and modeling

UNIT III OBJECT ORIENTED DESIGN 9

Design axioms - Designing Classes - Access Layer - Object Storage - Object Interoperability- GRASP: Designing objects with responsibilities - Creator - Information expert - Low Coupling - High Cohesion – Controller

UNIT IV APPLYING DESIGN PATTERNS 9

System sequence diagrams - Relationship between sequence diagrams and use cases - Logical architecture and UML package diagram - Logical architecture refinement - UML class diagrams - UML interaction diagrams - Applying GoF design patterns- adapter, singleton, factory and observer patterns

UNIT V TESTING 9

Designing Interface Objects - Software Quality Assurance –Testing strategies-Test cases-Test plan- Continuous Testing -System Usability -Measuring User Satisfaction- Case study- the Next Gen POS system

TEXT BOOKS:

Sl.No	Author(s)	Title of The Book	Publisher	Year of Publication
1.	Ali Bahrami,	Object Oriented Systems Development (UNIT I, II, III, V)	Tata McGraw-Hill, New Delhi.	2008
2.	Craig Larman	Applying UML and Patterns: An Introduction to object-oriented Analysis and Design and iterative development (UNIT II,III, IV, V)	Third Edition, Pearson Education	2005

REFERENCE BOOKS:

Sl.No	Author(s)	Title of The Book	Publisher	Year of Publication
1.	Mike O'Docherty	Object-Oriented Analysis & Design: Understanding System Development with UML 2.0	John Wiley & Sons	2005
2.	James W- Cooper	Java Design Patterns – A Tutorial	Addison-Wesley	2000
3.	Micheal Blaha, James Rambaugh,	Object-Oriented Modeling and Design with UML	Second Edition, Prentice Hall of India Private Limited	2007
4.	Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides,	Design patterns Elements of Reusable object-oriented software	Addison-Wesley	1995
5.	John Deacon	Object Oriented Analysis and Design	Pearson Education	2009

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COMPUTER SCIENCE AND ENGINEERING

19CSC24	CASE TOOLS LAB	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

1 Understand the concept of d mechanism involved in UML

2. Study the different types of relationships in classes, objects and terms related to diagrams

3. Develop and test the Domain objects layer

4. Apply GOF patterns for viewing a system as a set of procedures.

5.Prepare case studies for Testing techniques

COURSE OUTCOME:

At the end of the course, the students will able to

19CSC24.CO1 Identify the requirements of project according to the objective

19CSC24.CO2 Design the individual module of the given project

19CSC24.CO3 Implement use case diagrams and add interface to class diagrams.

19CSC24.CO4 Demonstrate Software Development

19CSC24.CO5 Perform a different software testing methods

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC24.CO1	x	-	-	-	-	-	x	x	-	x	-	x	x	-	-
19CSC24.CO2	-	-	x	-	x	x	-	x	x	x	-	-	x	-	x
19CSC24.CO3	-	x	-	-	-	x	x	-	-	-	x	x	-	x	-
19CSC24.CO4	x	-	x	x	x	-	-	-	x	-	x	-	x	-	x
19CSC24.CO5	x	x	x	x	-	-	-	-	x	-	-	x	x	x	-

LIST OF PROGRAMS

1. To develop a problem statement.
2. Identify Use Cases and develop the Use Case model.
3. Identify the conceptual classes and develop a domain model with UML Class diagram.
4. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence diagrams.
5. Draw relevant state charts and activity diagrams.
6. Identify the User Interface, Domain objects, and Technical services. Draw the partial Layered, logical architecture diagram with UML package diagram notation.
7. Develop and test the Technical services layer.
8. Develop and test the Domain objects layer.
9. Develop and test the User interface layer.

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COMPUTER SCIENCE AND ENGINEERING

SUGGESTED DOMAINS FOR MINI-PROJECT:

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference Management System
13. BPO Management System
14. Library Management System
15. Student Information System

SUGGESTED SOFTWARE TOOLS:

Argo UML, Eclipse IDE, Visual Paradigm, Star UML and Rational Rose Suite.

TOTAL:P:30

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COMPUTER SCIENCE AND ENGINEERING

19CSC25 **CRYPTOGRAPHY AND NETWORK SECURITY**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To define the OSI security architecture and classical encryption techniques
2. To describe various block cipher and stream cipher models.
3. To provide necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks
4. To gain the principles of public key cryptosystems, hash functions and digital signature
5. To make the techniques used for message authentication and confidentiality maintenance

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSC25.CO1 Understand the fundamentals of networks security, security architecture, threats and Vulnerabilities.
19CSC25.CO2 Apply the different cryptographic operations of symmetric cryptographic algorithms.
19CSC25.CO3 Analyze the different cryptographic operations of public key cryptography.
19CSC25.CO4 Evaluate the various Authentication schemes to simulate different applications.
19CSC25.CO5 Design various Security practices and System security standards.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC25.CO1	x	-	-	x	x	-	x	-	x	-	-	-	x	-	-
19CSC25.CO2	x	-	-	-	-	x	-	x	x	x	-	-	x		-
19CSC25.CO3	x	x	x	-	-	x	-	x	x	x	-	-	-	x	-
19CSC25.CO4	x	x	x	x	x	-	-	-	x	x	x	x	-	x	x
19CSC25.CO5	x	x	x	x	x	-	x	-	x	x	x	x	-	x	x

UNIT I INTRODUCTION 9

Computer Security Concepts - OSI Security Architecture - Security Attacks - Services - Mechanisms - Model for Network Security - Classical Encryption Techniques: Symmetric Cipher Model, Substitution: Ceaser cipher, Playfair cipher, Hill Cipher, Vigenere cipher, Vernam cipher - Transposition Techniques: Rail fence, Row and Column Transposition - Steganography.

UNIT II SYMMETRIC KEY CRYPTOGRAPHY 9

Number Theory and Finite Fields: The Euclidean Algorithm, Modular Arithmetic, Groups, Rings, and Fields - Traditional Block Cipher Structure - Data Encryption Standard, The Strength of DES - Advanced Encryption Standard - Block Cipher Operation

UNIT III ASYMMETRIC CIPHERS 9

Number Theory: Prime Numbers, Fermat's and Euler's Theorems, Primality Testing, The Chinese Remainder Theorem, Public-Key Cryptography: Principles of Public-Key Cryptosystems, The RSA Algorithm - Diffie-Hellman Key Exchange- Elliptic Curve Arithmetic - Elliptic Curve Cryptography

UNIT IV DATA INTEGRITY ALGORITHMS AND MUTUAL TRUST 9

Authentication requirement - Authentication function - MAC - Hash function - Security of hash function and SHA – MD5 -Digital Signatures: DSS - Elgamal Digital Signature Scheme - Key Management and Distribution: X.509 Certificates - Kerberos.

UNIT V INTERNET AND SYSTEM SECURITY 9

Electronic Mail security - PGP- IP security - Web Security: SSL - SET- System Security: Malicious Software - Intruders - Firewalls.

TOTAL :L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Cryptography and Network Security: Principles and Practice	Pearson Education	2014
2.	Atul Kahate	Cryptography and Network Security	Tata McGraw Hill	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	CharlesB. Pfleeger, Shari Lawrence P fleeger	Security in Computing	Pearson Education	2011
2.	Behrouz A.Foruzan	Cryptography and Network Security	Tata McGraw Hill	2007
3.	William Stallings	Cryptography and Network security Principles and Practices	Pearson Education	2006
4.	Javier López, Gene T sudik	Applied Cryptography and Network Security	Springer	2011
5.	Niels Ferguson	Cryptography Engineering: Design Principles and Practical Applications	JohnWiley	2010

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COMPUTER SCIENCE AND ENGINEERING

19CSC26 CRYPTOGRAPHY AND NETWORK SECURITY LAB

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. To know different cipher techniques
2. Develop the Various Security Algorithm
3. To study network security tools and vulnerability assessment tools
4. To generate different open source tools for network security and analysis

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSC26.CO1 Develop code for classical Encryption Techniques to solve the problems

19CSC26.CO2 Build cryptosystems by applying symmetric and public key encryption algorithms

19CSC26.CO3 Construct code for authentication algorithms

19CSC26.CO4 Develop a signature scheme using Digital signature standard

19CSC26.CO5 Demonstrate the network security system using open source tools

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC26.CO1	X	-	-	X	X	-	X	-	X	-	-	-	X	-	-
19CSC26.CO2	X	-	-	-	-	X	-	X	X	X	-	-	X		-
19CSC26.CO3	X	X	X	-	-	X	-	X	X	X	-	-	-	X	-
19CSC26.CO4	X	X	X	X	X	-	-	-	X	X	X	X	-	X	X
19CSC26.CO5	X	X	X	X	X	-	X	-	X	X	X	x	-	X	X

LIST OF PROGRAMS

1. Perform encryption, decryption using the following substitution techniques
(i) Ceaser cipher, (ii) Playfair cipher iii) Hill Cipher iv) Vigenere cipher
2. Perform encryption and decryption using following transposition technique - Row & Column Transformation
3. Implement the practical applications for the following algorithm DES
4. Implement the practical applications for the following algorithm AES
5. Implement RSA Algorithm using HTML and JavaScript
6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7. Implement the (i) Message Digest Algorithm – MD5 (ii) Secure Hash Algorithm – SHA 1
8. Implement the SIGNATURE SCHEME - Digital Signature Standard.
9. Setup a Honey Pot and Monitor the Honeypot on Network
10. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.

TOTAL:P: 30

SOFTWARE: C / C++ / Java or equivalent compiler, Snort, KF Senor or Equivalent

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COMPUTER SCIENCE AND ENGINEERING

19CSC27	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To understand the basic concepts of Hadoop.
2 To explore the functions with PIG.
3 To learn the functions of HIVE.
4 To describe use of Recommendation system .
5 To describe the concepts of Hadoop security

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC27.CO1 Identify the components of Hadoop Distributed File System for big data processing
19CSC27.CO2 Develop Big Data Solutions using Hadoop Eco System
19CSC27.CO3 Examine various framework in Big data Processing
19CSC27.CO4 Implement various Recommendation System
19CSC27.CO5 Illustrate the big data security issues with Hadoop and the need of AWS for Hadoop environment

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC27.CO1	x	-	-	-	-	-	x	x	-	x	-	x	x	-	-
19CSC27.CO2	-	-	x	-	x	x	-	x	x	x	-	-	x	-	x
19CSC27.CO3	-	x	-	-	-	x	x	-	-	-	x	x	-	x	-
19CSC27.CO4	x	-	x	x	x	-	-	-	x	-	x	-	x	-	x
19CSC27.CO5	x	x	x	x	-	-	-	-	x	-	-	x	x	x	-

UNIT I INTRODUCTION TO HADOOP ECO SYSTEM 9

Introduction to Hadoop Eco system- Hadoop core components- Hadoop distributions- HDFS- Common Hadoop Shell commands- Processing data with Hadoop- Name Node- Secondary Name Node, and Data Node – Hadoop Map Reduce paradigm- Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance..

UNIT II HADOOP ECOSYSTEM COMPONENTS-PIG 9

Big: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

UNIT III HADOOP ECOSYSTEM COMPONENTS-HIVE 9

Hive : Hive Shell, Hive Services, Hive Meta store, HiveQL, Tables, Querying Data and User Defined Functions. Base: HBase Concepts, Clients, Example, Zookeeper - Building applications with Zookeeper, Oozie- Workflows of Oozie

UNIT IV RECOMMENDATION SYSTEM 9

Collaborative Recommendation- Content Based Recommendation – Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT V HADOOP SECURITY AND AWS 9

Security challenges – Authentication – Authorization – Network encryption – Security enhancement – Introduction to AWS- Running Hadoop on AWS – EMR Hadoop relationship – AWS S3

TOTAL:L : 45

TEXT BOOK:

Sl.No	Author(s)	Title of The Book	Publisher	Year of Publication
1.	Seema Acharya, Subhashini Chellappan	Big Data and Analytics	Wiley, First Edition	2015

REFERENCE BOOKS:

Sl.No	Author(s)	Title of The Book	Publisher	Year of Publication
1.	Boris lublinsky, Kevin t. Smith, Alexey Yakubovich	Professional Hadoop Solutions	Wiley	2015
2.	Chris Eaton, Dirk deroos et al.	Understanding Big data	McGraw Hill	2012
3.	Tom White	HADOOP: The definitive Guide	O Reilly	2012
4.	VigneshPrajapati	Big Data Analytics with R and Haoop	Packet Publishing	2013
5	Tom Plunkett, Brian Macdonald et al	Oracle Big Data Handbook	Oracle Press	2014

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COMPUTER SCIENCE AND ENGINEERING

19CSC28 **ANIMATION: THEORY AND PRACTICE** **L T P C**

3 0 0 3

COURSE OBJECTIVES :

1 To State and identify animation
2 Understand the major technological developments
3 Analyze about aesthetic movements in the history of animated filmmaking.
4 Apply the early technologies used in animation
5 Illustrate the industry perspective

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC28.CO1 Understand the film history to provide a discussion on experimental animation and abstract cinema.
19CSC28.CO2 Analysis the evolution of animation, and how animation came into existence.
19CSC28.CO3 Apply the animation techniques developed with various equipment and how the process was performed
19CSC28.CO4 Develop techniques such as cell animation, classic characters, cut out animation, stop- motion effects, puppet stop motion, pixilation, optical printing,
19CSC28.CO5 Construct great animators helped to improvise animation to Indian directors.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC28.CO1	x	-	-	-	-	-	x	x	-	x	-	x	x	-	-
19CSC28.CO2	-	-	x	-	x	x	-	x	x	x	-	-	x	-	x
19CSC28.CO3	-	x	-	-	-	x	x	-	-	-	x	x	-	x	-
19CSC28.CO4	x	-	x	x	x	-	-	-	x	-	x	-	x	-	x
19CSC28.CO5	x	x	x	x	-	-	-	-	x	-	-	x	x	x	-

UNIT I EARLY ANIMATION 9

Introduction to film history, basic cinematic terms and concepts, early animation and primitive forms, the beginnings of animation and special effects in film. It also provides a discussion on experimental animation and abstract cinema

UNIT II EARLY STUDIOS AND ANIMATION PIONEERS 9

An overview of the evolution of animation pioneers such as Walt Disney, Max Fleischer, Tex Avery, Warner bros and Loony Tunes etc.,

UNIT III EARLY APPROACHES TO MOTION IN ART 9

Animation before film: The magic lantern, Thaumatrope, Phenakistoscope, Zoetrope, Flip book and Praxinoscope.

UNIT IV ANIMATION TECHNIQUES 9

Cell animation, classic characters, cut out animation, stop motion effects, puppet stop motion, pixilation, optical printing, vector / key framed animation, sand animation, silhouette animation, pin-screen animation, Chinese shadow puppetry and rotoscope

UNIT V A HISTORY OF INDIAN ANIMATION, INDUSTRIES AND STUDIOS 9

Growth of Indian animation companies and studios. Traces the beginnings of animation art in India and discusses the emerging trends in Indian animation industry and outsourcing demands.

TOTAL:L : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stephen cavalier	The world history of animation hardcover "Disney animation	Disney editions	1, 9 Sep 2011.
2.	Frank thomas "the illusion of life	Disney animation	(Disney editions deluxe)hardcover	import, 5 oct 1995

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Preston Blair, Walter T.	Cartoon Animation	Foster, Apple Press, Limited, Eighth Edition, ISBN 1560100842	2018
2.	Facts and Ficgures, Bredson , Philps Cardiff,	History of Animation	Pearson Publications,	2015
3.	Fell, John L., Berkeley Emmanuel,	Film and the narrative tradition	University of California Press,	1990
4.	Barry Keith Grant,	The Film Studies Dictionary	Dum Publications, Edition III	2008
5.	Emmons	Film and television: a guide to the reference literature",R	ISBN: 1563089149	ACEL Release, First Edition, Year 2009

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COMPUTER SCIENCE AND ENGINEERING

19CSC29 MACHINE LEARNING TECHNIQUES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES :

1 To understand the need for machine learning for various problem solving.
2 To analyze parametric methods and semi-parametric methods
3 To use neural networks for learning.
4 To explore different algorithms for Instance based learning
5 To apply appropriate machine learning algorithms for problem solving.

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC29.CO1 Understand supervised learning algorithms.
19CSC29.CO2 Describe the parametric and semi-parametric models.
19CSC29.CO3 Implement artificial neural network.
19CSC29.CO4 Apply machine learning techniques using neural networks to solve problems of interest
19CSC29.CO5 Develop graphical models and multiple learners

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC29.CO1	x	x	x	x	x	x	x	-	x	-	x	x	x	x	x
19CSC29.CO2	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x
19CSC29.CO3	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x
19CSC29.CO4	x	x	x	x	x	x	x	-	-	x	x	x	x	x	x
19CSC29.CO5	x	x	x	x	x	x	x	-	-	-	x	x	x	x	x

UNIT I INTRODUCTION AND SUPERVISED LEARNING 9

Introduction to Machine Learning – basic concepts in machine learning - Examples of machine learning applications-Supervised Learning: Learning a Class from Examples–Noise–Learning Multiple Classes–Regression–Model Selection and Generalization. Bayesian Decision Theory: Classification–Losses and Risks–Discriminant Functions– Association rules.

UNIT II PARAMETRIC AND SEMI-PARAMETRIC METHODS 9

Parametric Classification–Regression–Tuning Model Complexity–Model Selection Procedures. Multivariate Methods: Data–Parameter Estimation–Estimation of Missing Values–Multivariate Normal Distribution–Multivariate Classification and Regression. Semi parametric method: Clustering k–Means Clustering–Hierarchical Clustering.

UNIT III ARTIFICIAL NEURAL NETWORKS 9

Introduction-Neural Network representation- Appropriate problems for Neural Network Learning- Perceptron : Representational power of Perceptron- Training rule- Gradient descent and Delta rule-Multi layer networks and Back propagation algorithm-A differentiable threshold unit-Back propagation algorithm-Derivation of the back propagation rule-remarks on back propagation algorithm-Advanced topics in Neural Networks: Alternative error function-Error minimization procedures-Recurrent,networks-Dynamically modified Network structure.

UNIT IV INSTANCE BASED LEARNING 9

Introduction-K-Nearest Neighbor learning- Distance- Weighted Nearest Neighbor algorithm- Locally weighted regression- Remarks on locally weighted regression-Radial basis functions-case –Based reasoning- Remarks on Lazy and Eager Learning.

UNIT V ADVANCED LEARNING 9

Graphical model: Canonical cases for conditional independence-Combining multiple learners: Voting, Bagging, Boosting, Stacked generalization-Reinforcement Learning: Learning task –Q learning-Example.

TOTAL:L:45

TEXT BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publicatio
1.	Ethem Alpaydin	Introduction to Machine Learning	Second Edition, MIT Press	2013
2.	Tom M.Mitchell	Machine Learning	Mc Graw,First Edition	2015

REFERENCE BOOKS:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Y. S. Abu- Mostafa, M. Magdon-Ismail, and H.-T. Lin	Learning from Data	AML Book Publishers	2012
2.	K. P. Murphy	Machine Learning: A probabilistic perspective	MIT Press	2012
3.	M. Mohri, A. Rostamizadeh, and A. Talwalkar	Foundations of Machine Learning	MIT Press	2012
4.	Peter Flach	Machine Learning The Art and Science of Algorithms that	Cambridge University Press.	2012
5.	Richard Sutton and Andrew Barto	Reinforcement Learning: An Introduction	MIT Press	1998.

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COMPUTER SCIENCE AND ENGINEERING

19CSC30 DATA ANALYTICS AND MODELING TECHNIQUES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES :

1 To understand the basic principles of Data Analytics
2 To learn the various Data Analytic methods
3 To understand the various clustering algorithms and its application on data
4 To work with stream data model and computing
5 To understand the Advanced techniques in Data Analytics

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC30.CO1	Evaluate the use of data from acquisition through cleaning, warehousing, analytics, and visualization to the ultimate business decision
19CSC30.CO2	Mine data and carry out predictive modeling and analytics to support business decision-making
19CSC30.CO3	Suggest prescriptive modeling techniques for real-world problems
19CSC30.CO4	Execute real-time analytical methods on streaming datasets to react quickly to customer needs
19CSC30.CO5	Demonstrate the advanced techniques in data analytics

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC30.CO1	x	-	-	x	x	-	x	-	x	-	-	-	x	-	-
19CSC30.CO2	x	-	-	-	-	x	-	x	x	x	-	-	x		-
19CSC30.CO3	x	x	x	-	-	x	-	x	x	x	-	-	-	x	-
19CSC30.CO4	x	x	x	x	x	-	-	-	x	x	x	x	-	x	x
19CSC30.CO5	x	x	x	x	x	-	x	-	x	x	x	x	-	x	x

UNIT I INTRODUCTION TO DATA ANALYTICS 9

Introduction to Data Analytics - Types of Data Analytics - Predictive Analytics - Simple linear regression - Multiple linear regression - Auto regression - Moving Average - Autoregressive Integrated Moving Average - Data Pre-processing - Data Cleaning - Data Integration and Transformation - Data Reduction - Descriptive data analytics - measures of central tendency - measures of location of dispersions.

UNIT I DATA ANALYTICS METHODS 9

Association Rule Mining: Efficient and Scalable Frequent Item set Mining Methods - Mining Various Kinds of Association Rules - Association Mining to Correlation Analysis - Constraint Based Association Mining - Cluster Analysis: Types of Data in Cluster Analysis - A Categorization of Major Clustering Methods - Partitioning Methods - Hierarchical methods.

Unit III Clustering Algorithms 9

Introduction to Streams Concepts - Stream data model and architecture - Stream Computing - Sampling data in a stream - Filtering streams - Counting distinct elements in a stream - Estimating moments - Counting oneness in a window - Decaying window - Real Time Analytics Platform (RTAP) applications - case studies - real time sentiment analysis - stock market predictions.

UNIT IV GRAPH ANALYTICS 9

Using Graph Analytics for Big Data: Graph Analytics - The Graph Model - Representation as Triples - Graphs and Network Organization - Choosing Graph Analytics - Graph Analytics Use Cases - Graph Analytics Algorithms and Solution Approaches - Technical Complexity of Analyzing Graphs - Features of a Graph Analytics Platform - Considerations: Dedicated Appliances for Graph - Graph QL

UNIT V ADVANCED TECHNIQUES IN DATA ANALYTICS 9

NoSQL Databases - Schema-less Models - Increasing Flexibility for Data Manipulation - Key Value Stores - Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive-Sharding-Hbase - Analyzing big data with twitter - Big data for E-Commerce - Big data for blogs - Review of Basic Data Analytic Methods using R.

TOTAL:L:45

TEXT BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publicatio
1.	Jiawei Han, MichelineKamber, Jian Pei	"Data Mining Concepts and Techniques"	Third Edition, Elsevier	2011
2.	A. Rajaraman, J. Ullman	"Mining Massive Data Sets"	Cambridge University Press, 2012	2012
3.	David Loshin	"Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, No SQL, and		2013

REFERENCE BOOKS:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye	"Probability & Statistics for Engineers & Scientists"	Ninth Edition, Prentice Hall Inc.	
2.	Trevor Hastie, Robert Tibshirani, Jerome Friedman	"The Elements of Statistical Learning, Data Mining, Inference, and Prediction"	Second Edition, Springer,	2014
3.	G.James, D. Witten, T Hastie, R. Tibshirani	"An Introduction to Statistical Learning: With Applications in R"	Springer,	2013

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COMPUTER SCIENCE AND ENGINEERING

19CSC31 **MACHINE LEARNING** **L T P C**

3 0 0 3

COURSE OBJECTIVES :

1 To understand the need for machine learning for solving problem
2 To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
3 To understand the machine learning theory and implement linear and non-linear learning models
4 To implement distance-based clustering techniques , build tree and rule based models
5 To apply reinforcement learning techniques for solving real-time applications

COURSE OUTCOMES :

At the end of the course, the students will able to

19CSC31.CO1 Distinguish between, supervised, unsupervised and semi -supervised learning
19CSC31.CO2 Apply the apt linear model for any given problem
19CSC31.CO3 Suggest supervised, unsupervised or semi-supervised learning algorithms for assessing the distance-based analysis
19CSC31.CO4 Design systems that use the appropriate tree and rule models of machine learning
19CSC31.CO5 Apply reinforcement learning strategy for real-time applications

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSC31.CO1	x	x	-	-	x	x	-	x	x	-	x	x	x	x	-
19CSC31.CO2	x	x	x	x	x	x	-	x	-	x	x	x	x	x	x
19CSC31.CO3	x	x	-	x	-	x	-	x	x	x	x	-	x	-	x
19CSC31.CO4	x	x	x	x	x	-	x	x	-	x	x	x	-	x	x
19CSC31.CO5	x	x	x	x	-	-	x	x	x	x	x	x	x	x	x

UNIT I FOUNDATIONS OF LEARNING 9

Components of learning – learning models – geometric models – probabilistic models – logic models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound – approximation generalization tradeoff – bias and variance – learning curve

UNIT II LINEAR MODELS 9

Linear classification – univariate linear regression – multivariate linear regression – regularized regression – Logistic regression – perceptrons – multilayer neural networks – learning neural networks structures – support vector machines – soft margin SVM – going beyond linearity – generalization and overfitting – regularization – validation

UNIT III DISTANCE-BASED MODELS 9

Nearest neighbor models – K-means – clustering around medoids – silhouttes – hierarchical clustering – k-d trees – locality sensitive hashing – non-parametric regression – ensemble learning – bagging and random forests – boosting – meta learning

UNIT IV TREE AND RULE MODELS 9

Decision trees – learning decision trees – ranking and probability estimation trees – regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first-order rule learning

UNIT V REINFORCEMENT LEARNING 9

Passive reinforcement learning – direct utility estimation – adaptive dynamic programming – temporal-difference learning – active reinforcement learning – exploration – learning an action utility function – Generalization in reinforcement learning – policy search – applications in game playing – applications in robot control

TOTAL:L:45

TEXT BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Peter Flach	Machine Learning: The art and science of algorithms that make sense of data	Cambridge University Press	2012
2.	Andreas Muller,Sarah Guido	Introduction to Machine Learning with Python: A Guide for Data Scientists	4th Edition,O'Reilly	2018

REFERENCE BOOKS:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	T. M. Mitchell	Machine Learning	McGraw Hill	1997
2.	Ethem Alpaydin	"Introduction to Machine Learning(Adaptive Computation and Machine	3rd Edition, MIT Press	2014
3.	D. Barber	Bayesian Reasoning and Machine Learning	Cambridge University Press	2012
4.	Jiawei Han and Jian Pei	Data Mining Concepts and Techniques	3rd Edition, Morgan Kaufmann Publishers	2012

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COMPUTER SCIENCE AND ENGINEERING

19CSE01 **INTERNET OF THINGS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To be exposed to web, cloud in the context of IoT
- To develop different models for network dynamics
- To analyze applications of IoT in realtime scenario

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE01.CO1	Summarize the underlying architectures and models in IoT.
19CSE01.CO2	Analyze various protocols for IoT at the different layers for IoT
19CSE01.CO3	Apply the web of things and cloud of things Models
19CSE01.CO4	Develop different models for network dynamics
19CSE01.CO5	Study the needs and suggest appropriate solutions for Industrial applications

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE01.CO1	x	-	x	-	x	-	-	x	-	x	-	x	x	x	-
19CSE01.CO2	x	x	-	-	x	-	-	x	x	x	-	-	x	-	-
19CSE01.CO3	x	x	x	x	-	x	-	-	x	x	x	x	-	x	-
19CSE01.CO4	x	x	x	x	-	x	-	-	x	x	x	-	x	-	X
19CSE01.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I INTRODUCTION 9

Definitions and Functional Requirements –Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT – IoT Information Security

UNIT II IOT PROTOCALS 9

Sockets – secure sockets – custom sockets – UDP datagrams – multicast sockets – URL classes – Reading Data from the server – writing data – configuring the connection – Reading the header – telnet application – Java Messaging services.

UNIT III WEB OF THINGS 9

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing–Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

UNIT IV IOT BUSINESS MODELS 9

Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects – Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small-World Phenomenon.

UNIT V APPLICATIONS 9

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David Hanes,Gonzalo Salgueiro,Patrick,Grossetete, Rob Barton and Jerome Henry	Fundamentals:Networking Technologies, Protocols and Use Cases for Internet of Things	Cisco Press	2017
2.	Arshdeep Bahga,Vijay Madisetti	Internet of Things	A hands-on approach, Universities press	2015

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David Easley and Jon Kleinberg	Networks, Crowds, and Markets: Reasoning About a Highly Connected World	Cambridge University Press	2010
2.	Olivier Hersent, David Boswarthick, Omar Elloumi	The Internet of Things	A John Wiley & Sons, Ltd	2012
3.	Honbo Zhou	The Internet of Things in the Cloud: A Middleware Perspective	CRC Press	2012
4.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds)	Architecting the Internet of Things	Springer	2011
5.	Olivier Hersent, Omar Elloumi and David Boswarthick	The Internet of Things: Applications to the Smart Grid and Building Automation	Wiley	2012

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COMPUTER SCIENCE AND ENGINEERING

19CSE02 **INTERNET OF THINGS LAB** **L T P C**

0 0 2 1

COURSE OBJECTIVES

- To study the assembly language using simulator and kit.
- To implement ALU operations.
- To generate waveforms and test timers
- To develop applications using Embedded C language.
- To design IoT applications using Aurdino, Raspberry Pi, and Bluemix.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE02.CO1	Execute Assembly Language experiments using simulator.
19CSE02.CO2	Implement ALU operations.
19CSE02.CO3	Design waveforms and test timers.
19CSE02.CO4	Develop real time applications and explore ARM/PIC using Embedded C.
19CSE02.CO5	Demonstrate real time applications using Aurdino, Raspberry Pi, and Bluemix..

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE02.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE02.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE02.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE02.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	x
19CSE02.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

LIST OF PROGRAMS

1. Write 8051 Assembly Language experiments using simulator.
2. Test data transfer between registers and memory.
3. Perform ALU operations.
4. Using interrupts generate waveforms and test Timers.
5. Write assembly language experiments using Kit to test interfaces and interrupts using Traffic Generator, DAC, ADC, Stepper Motor (2).
6. Write Basic and arithmetic Programs Using Embedded C.
7. Write Embedded C program to test interrupt and timers.
8. Develop Real time applications – clock generation, wave form generation, counter using embedded C.
9. Explore ARM/PIC based controllers using Embedded C.
10. Explore different communication methods with IoT devices
11. Develop simple application – testing infrared sensor – IoT Applications – using Aurdino.

12. Develop simple application – testing temperature, light sensor – IOT Application using open platform/Raspberry Pi.

13. Deploy IOT applications using platforms such as Bluemix.

TOTAL : P : 30

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COMPUTER SCIENCE AND ENGINEERING

19CSE03 **SALESFORCE CRM AND PLATFORM** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To understand the basics of Salesforce as a CRM and a Platform
- To apply the administrative and configurable capabilities of Salesforce
- To implement business logic customizations using Apex triggers and classes customized using SOQL and DML
- To describe how trigger code works within the basics of the Save Order of Execution and transactions
- To illustrate Visual force markup code to customize the user interface

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE03.CO1 Understand the basics of Salesforce platform

19CSE03.CO2 Leverage configurable aspects of Salesforce for business process automation

19CSE03.CO3 Implement Apex Programming and Visual force

19CSE03.CO4 Develop Apex program with SOQL & DML, Testing and Execution of Triggers.

19CSE03.CO5 Apply Visualforce pages with various controllers.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE03.CO1	x	x	x	x	x	-	-	x	x	x	x	x	x	x	x
19CSE03.CO2	x	x	x	x	x	x	-	x	x	-	x	x	x	x	-
19CSE03.CO3	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
19CSE03.CO4	x	x	x	x	x	x	-	x	x	-	-	x	x	x	x
19CSE03.CO5	x	x	x	x	x	x	-	x	x	-	x	x	x	x	x

UNIT I INTRODUCTION TO SALESFORCE 9

Salesforce Overview - Architecture – Environment - Sales Cloud - Service Cloud - Navigating Setup - Salesforce Objects - Standard Objects - Custom Objects & Fields - Field Types - Master Detail - Lookup Relationship - Schema Builder - Global Search. Standard UI Configuration - Page Layouts - Record Types - Record Type Based Picklist Values. Process Automation - Validation Rules, Workflow Rules and Actions - Process Builder - Approval Process. Salesforce Security Model - Role Hierarchy - Profiles and Permission Sets - Access Controls - Object and Field Level Security - Record Level Security - Org Wide Defaults - Record Ownership - Sharing Rules.

UNIT II SALESFORCE CRM FUNCTIONALITY 9

CRM Basics : Introduction to CRM - Sales Objects - Service Objects. Sales Process: Lead - Web-to-Lead - Lead Conversion - Opportunities - Accounts & Contacts – Products. Service Process: Case, Email-to-Case, Web-to-Case. Automation Rules: Lead/Case Assignment Rules - Escalation Rules - Merge Records - Duplication Rules

UNIT III APEX PROGRAMMING BASICS 9

Programming with Apex: Introduction to Apex - Statements & Collections - Introduction to Apex Classes. SOQL: Syntax, SOQL in Apex, Dynamic SOQL. Query using relationships: Relationship name, child-to-parent relationship – parent-to-child relationship. DML essentials: DML operations with Apex - Transaction Controls - DML errors

UNIT IV APEX PROGRAMMING DEVELOPMENT 9

Apex Trigger Essentials: Introduction - Trigger Events - Syntax - Trigger context variables. Apex Class Implementation: Implement Business Logic in Apex class - Trigger Handlers and Controllers - Best Practices (Bulkification, No DML & queries inside loops) - Apex Test Classes. Advanced Apex: Asynchronous Apex - Apex Scheduler - Batch Apex - Future methods - Queueable Apex API Callouts - Apex Web Services - Standard APIs. Transactions: Lifecycle of a transaction – Memory life cycle for static variable - Salesforce order of Execution - Execution Governor Limits. Development Tools: Developer Console - Debug Logs - Eclipse & Force.com IDE - Visual Studio – Workbench

UNIT V VISUALFORCE DEVELOPMENT 9

Visualforce: Introduction – Creating Visualforce pages – Important Visualforce Tags - Exploring the View and Controller layers of Visualforce – Standard Controller – Display data from a record in a Visualforce page – Display related data – Invoke standard controller actions – Using standard list controller in a Visualforce page – Using custom controllers and extensions – Security concerns.

TOTAL: L: 45

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Paul Goodey, - Fourth Edition,	Salesforce CRM - The Definitive Admin Handbook	4th Revised edition Edition, PACKT enterprises, Kindle edition	2016
2.	Matt Kaufmann and Michael Wicherski	Learning Apex Programming	PACKT enterprises, Kindle edition	2015
3.	David Taber	Salesforce.com Secrets of Success: Best Practices for Growth and Profitability	2nd Edition, Prentice Hall	2013
4.	Keir Bowden	Visualforce Development Cookbook	PACKT enterprises, Kindle edition	2016

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COMPUTER SCIENCE AND ENGINEERING

19CSE04 **SALESFORCE CRM AND PLATFORM LAB**

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

- Understand the basic concepts of salesforce
- Develop the platform basics and console basics
- Implement the concept of Administrator
- Design SOQL database , .net, Visual force
- Analyze the Lightning Experiment basic

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE04.CO1 Analyze salesforce platform and Developer console basics
19CSE04.CO2 Enhance the SOQL database, .net, and visual force
19CSE04.CO3 Apply Apex basic for Admin and Trigger.
19CSE04.CO4 Create conference management application.
19CSE04.CO5 Implement visualforce application with the lightning design system.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE04.CO1	x	x	x	x	x	-	-	x	-	x	x	x	x	x	x
19CSE04.CO2	x	x	x	x	x	x	-	x	x	-	x	x	x	x	-
19CSE04.CO3	x	x	x	x	-	x	-	x	x	x	x	x	x	x	x
19CSE04.CO4	x	x	x	x	x	x	-	x	x	-	-	x	x	x	x

LIST OF PROGRAMS

1. Salesforce Basics
2. Salesforce Platform Basics
3. Platform Development Basics
4. Developer Console Basics
5. Apex Basics for Admin
6. Object Oriented Programming for Admin
7. Apex Triggers
8. SOQL Database .Net Basics
9. Visual force Basics
10. Lightning Experience Basics
11. Build a Conference Management Application
12. Build a Visual force Application with the Lightning Design System

TOTAL:P:30

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COMPUTER SCIENCE AND ENGINEERING

19CSE05 **AWS ACADEMY CLOUD DEVELOPING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To understand the basic concepts of Operating System.
- To understand the behavior of CPU scheduling and its application
- To choose and implement the process synchronization
- To understand and analyze various Memory management techniques
- To understand the I/O Management and disk scheduling management

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE05.CO1 Create on AWS.

19CSE05.CO2 Develop AWS Identity and Access Management for programmatic access.

19CSE05.CO3 Implement Container with AWS Lambda.

19CSE05.CO4 Organize solutions with Amazon API Gateway.

19CSE05.CO5 Construct secure applications and deploying applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE05.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE05.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE05.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE05.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	x
19CSE05.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I INTRODUCTION TO DEVELOPING ON AWS 9

Course Prerequisites, objectives and overview, AWS Training Portal, Lab Environment, AWS Free Tier, AWS Educate, Systems Development Lifecycle, Steps to Get Started Developing on AWS, Working with AWS SDKs, Errors and Exceptions, Introduction to AWS X-Ray, Introduction to Amazon CloudWatch and AWS CloudTrail, IAM - Shared Responsibility Model, Overview of IAM, Authentication with IAM, Authorization with IAM

UNIT II DEVELOPING STORAGE SOLUTIONS WITH AMAZON S3 9

Introduction to Amazon S3, Creating Amazon S3 Buckets, Working with Amazon S3 Objects, Protecting Data and Managing Access to Amazon S3 Resources. Developing NoSQL Solutions with Amazon DynamoDB - Introduction to Amazon DynamoDB, Amazon DynamoDB Key Concepts, Partitions and Data Distribution, Secondary Indexes, Read/Write Throughput, Streams and Global Tables, Backup and Restore, Basic Operations for Amazon DynamoDB Tables. Caching Information for Scalability - Caching Overview, Caching with Amazon CloudFront, Caching with Amazon ElastiCache, Caching Strategies.

UNIT III INTRODUCTION TO CONTAINERS WITH AWS LAMBDA 9

Introduction to Containers, Containers vs. Hardware Virtualization, Microservices – Use Case for Containers, Amazon Container Services. Developing Solutions with Amazon SQS and Amazon SNS - Introduction to Message Queues, Introduction to Amazon SQS, Amazon SQS Developer Concepts, Introduction to Amazon SNS, Amazon SNS Developer Concepts, Introduction to Amazon MQ. Developing Event – Driven solutions with AWS Lambda - Introduction to Serverless Computing with AWS Lambda, Overview of AWS Lambda, Execution Models for Invoking Lambda Functions, AWS Lambda Permissions, Overview of Authoring and Configuring Lambda Functions, Overview of Deploying Lambda Functions..

UNIT IV DEVELOPING SOLUTIONS WITH AMAZON API GATEWAY 9

Application Programming Interfaces, Amazon API Gateway, Creating a RESTful API, Controlling Access to a RESTful API, Testing a RESTful API, Deploying a RESTful API, Invoking a RESTful API, Monitoring a RESTful API. Developing solutions with AWS step functions - Workflow Coordination in Distributed Applications, Introduction to AWS Step Functions, State Types, AWS Step Functions Use Case, AWS Step Functions API. Developing secure application on AWS - Secure Network Connections, Manage Application Secrets, Authenticate with AWS Security Token Service, Authenticate with Amazon Cognito

UNIT V DEVELOPING APPLICATIONS ON AWS 9

Introducing DevOps Using AWS code services for CI/CD, Introducing Deployment and Testing Strategies, Developing Applications with AWS Elastic Beanstalk, Deploy applications AWS CloudFormation, Deploying Serverless applications AWS SAM

TOTAL : L :45

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COMPUTER SCIENCE AND ENGINEERING

		L	T	P	C
19CSE06	AWS ACADEMY CLOUD DEVELOPING LAB	0	0	2	1

COURSE OBJECTIVES

- To Understand and study AWS Documentation and AWS Cloud9
- To create an IAM User and IAM Group
- To develop Amazon S3 and AWS Lambda and Amazon API Gateway
- To perform an activity RCUs and WCUs
- To demonstrate AWS Lambda with API Gateway.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE06.CO1 Generate AWS Cloud9
19CSE06.CO2 Create IAM user and Group
19CSE06.CO3 Developing Amazon S3 and Amazon API Gateway using AWS SDK
19CSE06.CO4 Implement Docker Container.
19CSE06.CO5 Demonstrate AWS Lambda with API Gateway.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE06.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE06.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE06.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE06.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	X
19CSE06.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

LIST OF PROGRAMS

1. Activity - AWS Documentation Scavenger Hunt
2. Introduction to AWS Cloud9

   Educator Demo - AWS Cloud9
3. Educator Demo - Create an IAM User and IAM Group
4. Developing with Amazon S3 using the AWS SDK

   Activity - Calculate Read Capacity Units (RCUs)

   Activity - Calculate Write Capacity Units (WCUs)
5. Working with Docker Containers
6. Developing with AWS Lambda and Amazon API Gateway using the AWS SDK
7. Sandbox

TOTAL:P:30

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COMPUTER SCIENCE AND ENGINEERING

19CSE07 **AWS ACADEMY CLOUD ARCHITECTING** L T P C

3 0 0 3

COURSE OBJECTIVES

Illustrate how cloud adoption transforms the way IT systems work.

- Identify the benefits of Infrastructure as Code.
- Summarize database services for storing and deploying web-accessible applications.
- Describe how the AWS Well-Architected Framework improves cloud-based architectures.
- Evaluate the most important performance metrics for applications

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE07.CO1 Understand IT related work and access Amazon Web Services

19CSE07.CO2 Develop code for AWS Cloud Formatting & Amazon DynamoDB

19CSE07.CO3 Construct real time database application using current techniques

19CSE07.CO4 Demonstrate Cloud based architectures

19CSE07.CO5 Design real time application with performance metrics.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE07.CO1	x	x	-	-	x	-	-	x	-	-	x	-	x	-	-
19CSE07.CO2	x	-	x	x	x	-	x	-	-	-	x	-	-	x	-
19CSE07.CO3	x	-	x	-	x	x	x	-	-	x	x	-	-	-	x
19CSE07.CO4	x	x	x	-	x	x	-	--	x	-	x	x	x	-	-
19CSE07.CO5	x	-	-	-	x	-	-	x	-	x	x	-	-	x	-

UNIT I WELCOME TO AWS ACADEMY CLOUD ARCHITECTING 9

Course Prerequisites, Objectives, Overview, Creating AWS Training Portal Account, Accessing Course Materials. Designing Environment - Choosing a Region, Selecting Availability Zones, Virtual Private Cloud (VPC), Dividing VPCs and Subnets, Default VPCs and Default Subnets, Controlling VPC Traffic, Connecting Multiple VPCs, Integrating On-premises Components, VPC Best Practices. Designing for High Availabilty I - Load Balancing and Fault Tolerance, High Availability Across Regions, Connections Outside of Amazon VPC.

UNIT II DESIGNING FOR HIGH AVAILABILITY II AND INFRASTRUCTURE 9

Designing for High Availabilty II - Best Practice – Scalability, Determining if Scaling is Needed, Automatic Scaling, Scaling Data Stores, AWS Lambda and Event Driven Scaling. Automating Infrastructure - Manual Environment Configuration, Infrastructure as code on AWS, Grouping resources in a template, Resources not supported by AWS CloudFormation. Decoupling Infrastructure - Loose Coupling, Loose Coupling Strategies, Communicating Easily and Reliably Among Components, Communicating with Loose Coupling and Amazon DynamoDB, Amazon API Gateway, Serverless Architectures, Decoupling Examples

UNIT III DEVELOPING WEB SCALE MEDIA AND ARCHITECTED FRAMEWORK 9

Storing Web-Accessible Content with Amazon S3, Caching with Amazon CloudFront, Managing NoSQL Databases, Storing Relational Data in Amazon RDS. Architected Framework - Introduction to the Well-Architected Framework, Pillars of the Well-Architected Framework, Well-Architected Design Principles. Operational Excellence - Principles of the Operational Excellence Pillar, Drive Operational Excellence, Operational Excellence Pillar Questions

UNIT IV **WELL ARCHITECTED PILLARS: SECURITY,RELIABILITY,PERFORMANCE EFFICIENCY** 9

Security - Principles of the Security Pillar, Preventing Common Security Exploits, Securing Data in CloudFront, Encrypting Data, Authentication. Reliability - Principles of the Reliability Pillar, Making Infrastructure More Reliable, Reliability Pillar Questions. Performance Efficiency - Principles of the Performance Efficiency Pillar, Infrastructure Efficiency Improvements, Performance Efficiency Pillar Questions and Best Practice.

UNIT V **WELL-ARCHITECTED PILLARS : COST OPTIMIZATION, TROUBLESHOOTING, DESIGN PATTERNS AND SAMPLE ARCHITECTURES** 9

Cost Optimization - Principles of the Cost Optimization Pillar, Optimizing the Cost of Infrastructure, Dedicated Instances and Dedicated Hosts, Trusted Advisor, Optimizing Costs with Caching, AWS Cost Calculation Tools, Cost Optimization Questions. Troubleshooting - Troubleshooting Steps, AWS Support Options. Design Patterns - High-Availability Design Patterns, Stream Processing Example, Sensor Network Data Ingestion and Processing Example, Application Backend Example, Transcoding and Serving Video Files ExampleLayer Security - Firewalls.

TOTAL: L: 45

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		L	T	P	C
19CSE08	AWS ACADEMY CLOUD ARCHITECTING LAB	0	0	2	1

COURSE OBJECTIVES

- Formulate Auto scaling with AWS Lambda.
- To Summarize AWS Cloud formation.
- To decouple the infrastructure.
- To implement Serverless Architecture and Amazon CloudFront
- To Develop Amazon Route 53 and sandbox

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE08.CO1 Develop Auto scaling with AWS Lambda.
19CSE08.CO2 Deploy AWS Cloud formation.
19CSE08.CO3 Decoupling the infrastructure.
19CSE08.CO4 To implement Serverless Architecture and Amazon CloudFront
19CSE08.CO5 Construct Amazon Route 53 and sandbox.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE08.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE08.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE08.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE08.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	x
19CSE08.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

LIST OF PROGRAMS

1.Making Environment Highly Available

2.Using Auto Scaling with AWS Lambda

3.Automating Infrastructure Deployment with AWS Cloud Formation

4.Decoupling Infrastructure

5.Implementing a Serverless Architecture with AWS Managed Services

6.Introduction to Amazon CloudFront

7.Multi-Region Failover With Amazon Route 53

8.Sandbox

TOTAL:P:30

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COMPUTER SCIENCE AND ENGINEERING

19CSE09	INTERNET PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Understand the basic concepts of the Internetworking.
- Describe the creation of web site both client and server side.
- Implementing java-specific web services architecture.
- Explore the fundamental concepts of PHP in server side computing.
- Develop responsive web applications using AJAX.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE09.CO1	Illustrate the basic concepts of Networking.
19CSE09.CO2	Design a responsive web site using HTML5 and CSS3.
19CSE09.CO3	Applying different event handling mechanisms using JavaScript.
19CSE09.CO4	Build Dynamic web site using server side PHP Programming and Database connectivity.
19CSE09.CO5	Analyze different Web Extensions and Web Services.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE09.CO1	x	x	-	x	x	-	-	-	-	-	-	x	-	x	-
19CSE09.CO2	x	-	x	x	x	-	x	x	-	-	x	-	-	-	-
19CSE09.CO3	x	-	x	x	x	-	-	-	x	-	x	-	-	x	-
19CSE09.CO4	x	-	x	x	x	-	x	-	-	-	x	-	-	-	X
19CSE09.CO5	x	x	-	x	x	x	-	-	x	-	x	-	x	-	-

UNIT I INTERNETWORKING 9+6

Internetworking – Working with TCP/IP – IP address – sub netting – DNS – VPN – proxy servers – firewalls – Client/Server concepts - World Wide Web – components of web application – MIME types, browsers and web servers – types of web content – URL – HTML – HTTP protocol – Web applications – performance – Application servers – Web security. User Experience Design – Basic UX terminology – UXD in SDLC – Rapid prototyping in Requirements

UNIT II INTRODUCTION TO HTML 9+6

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls – CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT III SERVER SIDE PROGRAMMING 9+6

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions-Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL.

COMPUTER SCIENCE AND ENGINEERING

UNIT IV INTRODUCTION TO PHP 9+6

Introduction to PHP -Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT V WEB SERVICES AND AJAX 9+6

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Deitel and Deitel and Nieto	Internet and World Wide Web – How to Program	Prentice Hall, 5th Edition	2011
2.	Steven Holzner	The Complete Reference PHP	Tata McGraw-Hill	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jeffrey C and Jackson	Web Technologies A Computer Science Perspective	Pearson Education	2011
2.	Gopalan N.P. and Akilandeswari	Web Technology	Prentice Hall of India	2011
3.	Stephen Wynkoop and John Burke	Running a Perfect Website	QUE, 2nd Edition	1999
4.	UttamK.Roy	Web Technologies	Oxford University Press	2011
5.	Chris Bates	Web Programming – Building Intranet Applications	Wiley Publications 3rd Edition	2009

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COMPUTER SCIENCE AND ENGINEERING

19CSE10 CURRENT PRACTICES IN SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Remember the basic concepts of software Engineering and life cycle models.
- Summarize the requirements elicitation.
- Analyze the design interactive system.
- Illustrate the quality assurance using testing.
- Develop the different levels of maintaining project

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE10.CO1 Enumerate the software modeling for various real time problems

19CSE10.CO2 Identify the elicitation techniques and integrate the requirements

19CSE10.CO3 Develop the modal and framework for real-time application

19CSE10.CO4 Analyze the quality of the software and verify the product.

19CSE10.CO5 Implement software project management for security systems

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE10.CO1	x	-	x	-	x	-	-	x	-	x	-	x	x	x	-
19CSE10.CO2	x	x	-	-	x	-	-	x	x	x	-	-	x	-	-
19CSE10.CO3	x	x	x	x	-	x	-	-	x	x	x	x	-	x	-
19CSE10.CO4	x	x	x	x	-	x	-	-	x	x	x	-	x	-	x
19CSE10.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I SOFTWARE ENGINEERING PARADIGMS 9

Software Engineering-Challenges- Software process- Component-Based Software Engineering-Importance of Paradigms; Life Cycle Models-Waterfall Model-Incremental model-Prototyping Model-Spiral Model-RAD-Object oriented model-Win-Win Spiral model.

UNIT II SOFTWARE REQUIREMENT ANALYSIS AND SPECIFICATION 9

Requirement Analysis - Elicitation of requirements- System and software requirements- Functional and non-functional requirements- Domain requirements- User requirements- Software requirement Specification- SRS format- Software Requirement Essentials – Requirements from Customer Perspective

UNIT III SOFTWARE ENGINEERING DESIGN 9

Design Process- Logical and Physical DFDs, ERD, Data Dictionary- Functional Modeling and Data Flow, Data Modeling, Mechanics of Structured Analysis-Transform and Transaction Analysis, Structure Chart-Modularity-Other methods-User Interface Design-Component Level Design- Cohesion-Coupling-Information hiding-Functional independence

UNIT IV CODING-TESTING AND IMPLEMENTATION 9

Programming languages and development tools- Good programming practices- Coding Standards- Testing-Software testing Fundamentals- White Box and Black Box Testing, Test Case Design, Unit Testing, Integration Testing-Software Quality Assurance – Verification and Validation- Software Implementation

COMPUTER SCIENCE AND ENGINEERING

UNIT V MANAGING SOFTWARE PROJECTS-AGILE METHODOLOGY 9

Management activities-Software Metric- Software Size Estimation and Cost Estimation–LOC-COCOMO Model – Standards- ISO9000- CMM-Theories for Agile management – agile software development – traditional model vs. agile model- Web Engineering and Agile process-Project Scheduling-Earned value analysis-Risk Management

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Roger S.Pressman	Software Engineering	The mcGrawHill	2010
2.	V.R.Kavitha	Software Engineering	Magnus Publications	2016

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Karl E Wiegers and Joy Beatty	Software Requirements	Microsoft Press	2013
2.	Robert Martins	Clean code-Agile Technology	Prentice hall	2008
3.	Rajib Mall	Fundamentals of Software Engineering	The mcGrawHill	2009
4.	Ian Sommerville	Software Engineering	Addison-Wesley	2008
5.	Wikibooks 2013	Introduction to Software Engineering	E-Book	2013

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COMPUTER SCIENCE AND ENGINEERING

19CSE11 **COMPUTER GRAPHICS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Introduce the concept about graphics hardware devices and software used.
- Understand the two dimensional graphics and their transformations.
- Describe three dimensional graphics and their transformations.
- Demonstrate the illumination and color models.
- Enhance the concept of Animation designing..

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE11.CO1 Apply algorithm to draw fundamental drawings (Line, Ellipse and Circle)

19CSE11.CO2 Apply algorithm for 2D images clipping and transformation.

19CSE11.CO3 Illustrate 3D images clipping and transformation operation.

19CSE11.CO4 Construct illumination models and color model applications.

19CSE11.CO5 Design animation applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE11.CO1	x	x	x	-	-	-	-	-	-	-	-	-	x	x	-
19CSE11.CO2	x	x	x	-	-	-	-	-	-	-	-	-	x	x	-
19CSE11.CO3	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
19CSE11.CO4	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
19CSE11.CO5	-	x	x	-	-	-	-	x	-	-	-	-	-	x	x

UNIT I INTRODUCTION 9

Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms..

UNIT II TWO DIMENSIONAL GRAPHICS 9

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms

UNIT III THREE DIMENSIONAL GRAPHICS 9

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. Transformation and Viewing: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT IV ILLUMINATION AND COLOUR MODELS 9

Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection.

UNIT V ANIMATIONS & REALISM 9

Animation Graphics: Design of Animation Sequences – Animation Function – Raster Animation – Key Frame Systems – Motion Specification –Morphing – Tweening. Computer Graphics Realism: Tiling the Plane – Recursively Defined Curves – Koch Curves – C Curves – Dragons – Space Filling Curves – Fractals – Grammar Based Models – Fractals – turtle graphics – ray tracing.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley	Computer Graphics: Principles and Practice	3rd Edition, Addison-Wesley Professional	2013
2.	Donald Hearn and Pauline Baker M	Computer Graphics	Prentice Hall, New Delhi	2007

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Donald Hearn and M. Pauline Baker, Warren Carithers	Computer Graphics with Open GL, 4th Edition	Pearson Education	2010
2.	Jeffrey McConnell	Computer Graphics :Theory into Practice	Jones and Bartlett Publishers	2006
3.	Hill F S Jr	Computer Graphics	Maxwell Macmillan	1990

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COMPUTER SCIENCE AND ENGINEERING

19CSE12 **DISTRIBUTED PROGRAMMING** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Understand the basic Characterization of Distributed Systems.
- Analyze the inter process communication paradigms in distributed environment.
- Illustrate and synchronize process states for different networks
- Apply the different Distributed File Systems
- Implement the concept of distributed transaction and its concurrency control techniques

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE12.CO1	Demonstrate knowledge of the basic elements and concepts related to distributed system
19CSE12.CO2	Apply the inter process communication paradigms in distributed environment
19CSE12.CO3	Develop various operating system support of the distributed File systems
19CSE12.CO4	Analyze the file system structure and Synchronization
19CSE12.CO5	Implement concurrency control techniques for distributed transactions

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE12.CO1	-	x	-	-	x	-	-	x	-	-	x	-	x	-	-
19CSE12.CO2	x	-	x	x	-	-	x	-	-	-	-	-	-	x	-
19CSE12.CO3	-	-	x	-	-	x	x	-	-	x	-	-	-	-	x
19CSE12.CO4	-	-	-	-	-	x	-	--	x	-	-	x	x	-	-
19CSE12.CO5	x	-	-	-	x	-	-	x	-	x	-	-	-	x	-

UNIT I CHARACTERIZATION OF DISTRIBUTED SYSTEMS 9

Introduction: Evolution of Distributed Computing -Issues in designing a distributed system- Challenges- Minicomputer model – Workstation model - Workstation-Server model– Processor - pool model - Trends in distributed systems-Examples of DS-Resource sharing and the Web- Challenges **System Models:** Architectural Models- Fundamental Models.

UNIT II INTER PROCESS COMMUNICATION 9

Message Passing: Inter process Communication-Desirable Features of Good Message-Passing Systems- Issues in IPC by Message- Synchronization- Buffering-Multi datagram Messages-Encoding and Decoding of Message Data- Process Addressing- Failure Handling- Group Communication

UNIT III OPERATING SYSTEM SUPPORT 9

Operating System Support: Introduction, The OS layer, Protection, Processes and Threads, Communication and Invocation , Operating system architecture **Distributed File Systems:** Introduction, File Service architecture, Sun Network File System **Synchronization:** Clock Synchronization, Event Ordering, Mutual Exclusion, Election Algorithms

UNIT IV DISTRIBUTED FILE SYSTEMS 9

Desirable Features of a good Distributed File Systems- File Models-File Accessing Models-File-sharing

Semantics- File caching Schemes-File Replication- Fault Tolerance- Design Principles-Sun's network file system- Andrews file system- comparison of NFS and AFS.

UNIT V DISTRIBUTED TRANSACTIONS 9

Distributed Transactions: Introduction, Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, distributed deadlocks- Transactions, Nested transactions- Locks-Optimistic concurrency control . **Case Studies:** Mach & Chorus- Group communication - Publish - subscribe systems.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	George Coulouris, Jean Dollimore and Tim Kindberg	Distributed Systems: Concepts and Design Fifth Edition	Pearson Education	2011
2.	Pradeep K Sinha	Distributed Operating Systems : Concepts and Design	Prentice Hall of India	2009

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	A S Tanenbaum and M V Steen	Distributed Systems: Principles and paradigms	Pearson Education	2007
2.	M Solomon and J Krammer	Distributed Systems and Computer Networks	PHI	2012
3.	George Coulouris, Jean Dollimore, and Tim Kindberg.	Distributed Systems : Concepts and Design	Prentice Hall of India	2006
4	Vijay K. Garg, Wiley	Elements of Distributed Computing	Pearson Education	2002
5	Andrew Tanenbaum and Maarten van Steen,	Distributed Systems: Principles	Prentice Hall	2007

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COMPUTER SCIENCE AND ENGINEERING

19CSE13 **ENTERPRISE PROJECT DEVELOPMENT USING FOSS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Understand the concepts, strategies and methodologies related to OSS.
- Analysis the business, economy, social and intellectual properties and issues
- Apply the OSS product and development tool in the market.
- Construct the utilization of OSS for web application development.
- Implement the programming language for script development.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE13.CO1 State the various open source licenses.
19CSE13.CO2 Understand Linux build systems.
19CSE13.CO3 Discuss the configuration of web server.
19CSE13.CO4 Illustrate the concept of script.
19CSE13.CO5 Demonstrate programming language script to develop simple application.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE13.CO1	x	x	x			-	-	-	x	-	x	x	x	-	x
19CSE13.CO2	x	x	x	x	-	-	-	-	-	-	x	x	x	x	x
19CSE13.CO3	x	x	x	x	x	x	-	x		-	x	x	x	x	-
19CSE13.CO4	x	x	x	x	-	-	-	x	-	x	x	x	x	x	x
19CSE13.CO5	x	x	x	x	-	x	-	x		-	-	x	x	x	x

UNIT I GNU/LINUX ARCHITECTURE AND DEVELOPMENT TOOLS 9

GNU/Linux Architecture, Architectural Breakdown of Major Kernel Components, Linux distributions, GNU Compiler Tool Chain, Building Software with GNU Make, Makefile Constructs. StaticShared-Dynamic Libraries, Building packages with Automake/Autoconf.

UNIT II DEPLOYMENT TOOLS 9

Components of a LAMP Server, Manage Multiple Websites with Virtual Hosts, Encrypt Sensitive Pages with SSL, Enable Server-side Includes and CGI Scripts.

UNIT III FILE HANDLING TOOLS AND GRAPHICS TOOLS 9

File Handling-API-Character access mechanisms, String access mechanisms, Sequential and Random access methods, Graphics File Formats, Diagramming with Dia, Open Office Draw, GIMP.

UNIT IV TEXT PROCESSING TOOLS 9

Bash beginnings, Pathnames and Permissions, Useful elements, cron Job, Script Versions Text Processing with awk and sed scripts

UNIT V VERSIONING CONTROL, COPYRIGHT ISSUES AND LICENSES 9

Standards for free software projects, Version Control, Bug Tracker, Wikis, Website Licenses, Patents, Copyright assignment and Ownership, Dual Licensing Schemes.

TOTAL: L: 45

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	M.Tim Jones	GNU/Linux Application Programming	Dream Tech Press	2005
2.	Dream Tech Press	Producing Open Source Software	O"Reilly Media Inc	2005
3.	Janet Valade	Spring into Linux	Pearson Education	2006
4.	Tom Adelstein and Bill Lubanovic	Linux System Administration	O"Reilly	2007

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	I.Christopher Negus	Linux Bible	Wiley	2006
2.	Ellie Quigley	PERL by Example	Pearson Education	2009

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COMPUTER SCIENCE AND ENGINEERING

19CSE14 **PARALLEL COMPUTING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To examine the scalability and clustering issues in Parallel Computing Environment
- To understand the technologies enabling parallel computing
- To study the different types of interconnection networks
- To design various parallel programming models
- To discuss the software support required for shared memory programming

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE14.CO1	Summarize the issues in implementing parallelism and Communication
19CSE14.CO2	Apply parallel computing architectures for any given problem
19CSE14.CO3	Appraise the Network requirements for implementing Parallel Computing environment
19CSE14.CO4	Design applications by incorporating parallel computing architectures
19CSE14.CO5	Develop Programs for message passing through the Interfaces

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE14.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE14.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE14.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE14.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	x
19CSE14.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I SCALABILITY AND CLUSTERING 9

Evolution of Computer Architecture – Dimensions of Scalability – Parallel Computer Models – Basic Concepts Of Clustering – Scalable Design Principles – Parallel Programming Overview – Processes, Tasks and Threads – Parallelism Issues – Interaction / Communication Issues –Semantic Issues in Parallel Programs.

UNIT II ENABLING TECHNOLOGIES 9

System Development Trends – Principles of Processor Design – Microprocessor Architecture Families – Hierarchical Memory Technology – Cache Coherence Protocols – Shared Memory Consistency – Distributed Cache Memory Architecture – Latency Tolerance Techniques – Multithreaded Latency Hiding..

UNIT III SYSTEM INTERCONNECTS 9

Basics of Interconnection Networks – Network Topologies and Properties – Buses, Crossbar and Multistage Switches, Software Multithreading – Synchronization Mechanisms..

UNIT IV PARALLEL PROGRAMMING 9

Paradigms and Programmability – Parallel Programming Models – Shared Memory Programming.

UNIT V MESSAGE PASSING PROGRAMMING 9

Message Passing Paradigm – Message Passing Interface – Parallel Virtual Machine

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kai Hwang and Zhi.Wei Xu,	Scalable Parallel Computing	Tata McGraw-Hill	2003
2.	David E. Culler & Jaswinder Pal Singh	Parallel Computing Architecture: A Hardware/Software Approach	Morgan Kaufman Publishers	1999

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Michael J. Quinn	Parallel Programming in C with MPI & OpenMP	Tata McGraw-Hill	2003
2.	Kai Hwang	Advanced Computer Architecture	Tata McGraw-Hill	2003
3.	A Grama, A Gupra, G Karypis, V Kumar	Introduction to Parallel Computing	Addison Wesley	2003
4.	C Lin, L Snyder	Principles of Parallel Programming	Addison Wesley	2008
5.	T Mattson, B Sanders, B Massingill	Patterns for Parallel Programming	Addison-Wesley	2004

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COMPUTER SCIENCE AND ENGINEERING

19CSE15 **KERNEL PROGRAMMING** L T P C

3 0 0 3

COURSE OBJECTIVES

- Understanding the design of Linux kernel components
- Experiencing the kernel by passive/active observation
- Extending the Linux kernel for understanding, self satisfaction/falsification ...
- Exploring current research trends in OS, Linux being the reference OS
- To learn the level of linux security

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE15.CO1	Configure, build, and install the Linux kernel
19CSE15.CO2	Describe the Linux kernel source code
19CSE15.CO3	Explain the various functions of the Linux kernel, including file system, scheduler, and memory management.
19CSE15.CO4	Construct kernel modules for the Linux kernel
19CSE15.CO5	Implement customized extensions to the Linux kernel

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE15.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE15.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE15.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE15.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	x
19CSE15.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I INTRODUCTIONS TO KERNEL PROGRAMMING 9

Contemporary operating systems, Linux and its evolution, Systems programming, Basic Linux installation and administration, Linux kernel architecture, Lab: installing and compiling Linux kernel General kernel ,responsibilities, Kernel organization, Kernel modules Lab: implementing a new kernel module.

UNIT II KERNEL SERVICES 9

System calls, Signals and interrupts, proc file system, Lab: adding a new system call Managing Memory: Address architecture, address space, Virtual memory, memory mapping, Paging, switching, caching, Lab: doing a project on virtual memory

UNIT III MANAGING PROCESSES 9

Process, kernel thread, tasklet, Context switch and scheduling, Interrupts, signals, and exceptions Lab: doing a project on light weight process, Managing Times and Synchronization Kernel timer, hardware clocks, IPC, The Linux/SMP kernel, Lab: doing a project on time synchronization or SMP

UNIT IV LINUX DEVICES AND NETWORKING 9

Linux device driver architecture, Device filesystem (devfs), Hardware I/O, Lab: writing a new device driver, Linux File systems, Virtual filesystem (VFS),LVM and RAID, Journaling file system (JFS), Lab: writing a new file system, Multiplexing and demultiplexing, Linux TCP/IP Stack, Netfilter and advanced networking.

UNIT V LINUX SECURITY 9

Protection, Secure file system, Packet filters, Lab: NSA security-enhanced linux, Contemporary Topics,

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Embedded Linux, Low-power/power-efficient Linux, Lab: doing a project in embedded Linux kernel, Linux, Lab: writing a new protocol module.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Daniel P. Bovet & Marco Cesati,O'Reilly & Associates	Understanding the Linux Kernel	ISBN 0-596-00002-2	October 2000,
2.	Addison Wesley	Kernel Projects for Linux By Gary Nutt	ISBN: 0-201-61243-7	July 2000

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Daniel P. Bovet, Marco Cesat	Understanding the Linux Kernel,	Springer	2017
2.	Robert Love	Linux Kernel Development	Springer	3rd Edition, 2015
3.	Jonathan Corbet, Greg Kroah-Hartman, Alessandro Rubini	Linux Device Drivers	Springer	, 3rd Edition, 2014
4	Marcel Gagné, Addison Wesley	inux System Administration: A User's Guide	ISBN: 0-201-71934-7	September 2001
5	Alessandro Rubini & Jonathan Corbet	Linux Device Drivers	ISBN 0-596-00008-1	2nd Edition 2001

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COMPUTER SCIENCE AND ENGINEERING

19CSE16	SOFT COMPUTING TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Classify the various soft computing frame works
- Design the supervised learning network & unsupervised learning network
- Illustrate mathematical background for optimized genetic programming
- Restate to neuro-fuzzy hybrid systems and its applications.
- Apply the hybrid soft computing techniques

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE16.CO1	Apply various soft computing concepts for practical applications
19CSE16.CO2	Design suitable neural network for real time problems
19CSE16.CO3	Construct fuzzy rules and reasoning to develop decision making and expert system
19CSE16.CO4	Summarize the importance of optimization techniques and genetic programming
19CSE16.CO5	Develop the various hybrid soft computing techniques and apply in real time problems

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE16.CO1	x	x	x	-	-	-	-	-	-	-	-	-	x	x	-
19CSE16.CO2	x	x	x	-	-	-	-	-	-	-	-	-	x	x	-
19CSE16.CO3	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
19CSE16.CO4	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
19CSE16.CO5	-	x	x	-	-	-	-	x	-	-	-	-	-	x	x

UNIT I INTRODUCTION TO SOFT COMPUTING 9

Soft Computing Constituents-From Conventional AI to Computational Intelligence- Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks - basic models - important technologies - applications. Fuzzy logic: Introduction - crisp sets- fuzzy sets - crisp relations and fuzzy relations: cartesian product of relation - classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets. Genetic algorithm Introduction - biological background - traditional optimization and search techniques - Genetic basic concepts

UNIT II NEURAL NETWORKS 9

McCulloch-Pitts neuron - linear separability - hebb network - supervised learning network: perceptron networks - adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNNassociative memory network: auto-associative memory network, hetero-associative memory network, BAM, hopfield networks, iterative auto associative memory network & iterative associative memory network –unsupervised learning networks: Kohonen self-organizing feature maps, LVQ – CP networks, ART network.

UNIT III FUZZY LOGIC 9

Membership functions: features, fuzzification, methods of membership value assignments Defuzzification:

lambda cuts - methods - fuzzy arithmetic and fuzzy measures: fuzzy arithmetic - extension principle - fuzzy measures - measures of fuzziness -fuzzy integrals - fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems overview of fuzzy expert system-fuzzy decision making.

UNIT IV GENETIC ALGORITHM 9

Genetic algorithm- Introduction - biological background - traditional optimization and search techniques - Genetic basic concepts - operators – Encoding scheme – Fitness evaluation – crossover - mutation - genetic programming – multilevel optimization – real life problem- advances in GA .

UNIT V HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS 9

Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic hybrid systems - simplified fuzzy ARTMAP - Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

TOTAL: L: 4

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	J.S.R.Jang, C.T. Sun and E.Mizutani	Neuro-Fuzzy and Soft Computing	PHI / Pearson Education	2004
2.	S.N.Sivanandam and S.N.Deepa	Principles of Soft Computing	Wiley India Pvt Ltd	2011

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S.Rajasekaran and G.A.Vijayalakshmi Pai	Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications	Prentice-Hall of India Pvt. Ltd.,	2006
2.	George J. Klir, Ute St. Clair, Bo Yuan	Fuzzy Set Theory: Foundations and Applications	Prentice Hall	1997
3.	David E. Goldberg	Genetic Algorithm in Search Optimization and Machine Learning	Pearson Education India	2013
4	James A. Freeman, David M. Skapura	Neural Networks Algorithms, Applications, and Programming Techniques	Pearson Education India	1991
5	Simon Haykin	Neural Networks Comprehensive Foundation	Second Edition, Pearson Education	2005

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COMPUTER SCIENCE AND ENGINEERING

19CSE17	VIRTUAL REALITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Understand the concepts on Virtual Environment and 3D Modeling
- Analyzing modeling strategies
- Summaries concept on Animating the Virtual Environment
- Illustrate the Integrated VR systems
- Apply VR Application in real time.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE17.CO1	Understanding the concepts of Virtual Modeling and Environment
19CSE17.CO2	Analysis facts about the Geometric modeling and its Virtual Environment
19CSE17.CO3	Summaries basic techniques in designing transmission systems and Apply the software and hardware
19CSE17.CO4	Predict the technologies related to virtual reality and application of virtual reality system.
19CSE17.CO5	Apply virtual reality in real-world applications and do VRML programming

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE17.CO1	x	x	x	x		-	-	-	-	-	-	x	x	x	-
19CSE17.CO2	x	x	x	x	x	-	x	-	x	x	x	x	x	x	x
19CSE17.CO3	x	x	x	x	-	-	-	x	-	-	x	x	x	x	x
19CSE17.CO4	x	x	x	x	-	x	-	x	-	x	x	x	x	x	x
19CSE17.CO5	x	x	x	x	x	x	x	-		-	x	x	x	x	x

UNIT I INTRODUCTION 9

Virtual Reality & Virtual Environment : Introduction – Computer graphics – Real time computer-graphics – Flight Simulation – Virtual environments –Requirement for virtuality – benefits of virtual reality- Historical development of VR : Introduction – Scientific Landmark -3D Computer Graphics : Introduction – The Virtual world space – positioning the virtual of server – the perspective projection – human vision – stereo perspective projection – 3D clipping – Colour theory – Simple 3D modeling – Illumination models – Reflection models – Shading algorithms – Radiosity – Hidden-Surface removal– Realism – Stereographic usages.

UNIT II GEOMETRIC MODELING 9

Geometric Modeling : Introduction – From 2D to 3D – 3D space curves – 3D boundary representation – Other modeling strategies-Geometrical Transformations: Introduction – Frames of reference – Modeling transformations – Instances – Picking – Flying – Scaling the VE – Collision detection - A Generic VR system : Introduction – The virtual environment – the Computer environment – VR Technology – Model of interaction – VR System

UNIT III VIRTUAL ENVIRONMENT 9

Animating the Virtual Environment: Introduction – The dynamics of numbers – the animation of objects –shape & object in between – free-form deformation – particle system Physical Simulation : Introduction – Objects falling in a graphical field – Rotating wheels – Elastic collisions – projectiles – simple pendulum – springs – Flight dynamics of an aircraft.

UNIT IV VR HARDWARES & SOFTWARES 9

Human Factors : Introduction – the age- the ear- the semantic senses – equilibrium – conclusions - VR Hardware : Introduction – sensor hardware – Head-coupled displays – Aquatic hardware – Integrated VR systems-VR Software: Introduction – Modeling virtual world –Physical simulation- VR tool kits

UNIT V VR APPLICATION 9

Introduction – Engineering – Entertainment – Science – Training – The Future : Introduction – Virtual Equipments – modes of interaction – conclusion

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	John Vince	Virtual Reality Systems	Pearson Education Asia	2001

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Adams	Visualizations of Virtual Reality	Tata McGraw Hill	2000
2.	William R. Sherman, Alan B. Craig	Understanding Virtual Reality: Interface, Application, and Design"	Morgan Kaufmann, 1st Edition	2002
3.	Fei GAO	Design and Development of Virtual Reality Application System	Tsinghua Press	2012

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COMPUTER SCIENCE AND ENGINEERING

19CSE18 STORAGE INFRASTRUCTURE MANAGEMENT

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Evaluate Storage System Environment and storage architecture
- Describing storage networking technologies such as FC – SAN, NAS, IP – SAN and data archival solution CAS
- Create logical and physical components of a storage infrastructure including storage subsystems
- Identifying difference storage replication technologies and their benefits
- Illustrate business continuity solutions including, backup and recovery technologies, and Local and remote

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE18.CO1	Identify the performance of Key challenges in managing information
19CSE18.CO2	Analyze the technologies in storage networks
19CSE18.CO3	Implementing the advance storage networks and Virtualization
19CSE18.CO4	Apply of replications and network infrastructure and replication
19CSE18.CO5	Summarize the business techniques and analyze the risk in business continuity

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE18.CO1	x	-	x	-	-	-	x	-	x	-	-	-	-	x	
19CSE18.CO2	-	x	-	-	x	x	-	-	-	x	-	-	-	-	x
19CSE18.CO3	x	-	-	x	-	-	x	-	-	-	-	x	x	-	-
19CSE18.CO4	-	x	-	-	x	-	-	x	-	-	x	-	-	-	x
19CSE18.CO5	-	-	x	x	-	-	-	-	-	x	-	x	-	x	-

UNIT I INTRODUCTION 9

Introduction to Information Storage and Management: Information storage – Evolution of storage technology and architecture – Data center Infrastructure - Key challenges in managing information – Information life cycle-Storage System Environment: Components of Host. RAID – implementation of RAID – RAID array components – RAID levels – RAID Comparison - Host spares. Intelligent storage System – Components –Intelligent storage array

UNIT II STORAGE NETWORKING TECHNOLOGIES 9

Direct – Attached storage and introduction to SCSI: Types of DAS – DAS benefits and limitations Disk Drive Interfaces – Introduction to Parallel SCSI – SCSI command model-Storage Area Networks – Fiber channel – SAN evolution - SAN components – FC Connectivity – Fiber channel ports – Fiber Channel Architecture - Zoning – Fiber Channel login types – FC Topologies. Benefits of NAS –NAS file I/O – Components of NAS – NAS implementation – NAS file sharing protocols – NAS I/O operations

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UNIT III ADVANCED STORAGE NETWORKING AND VIRTUALIZATION 9

iSCSI – FCIP – Fixed content and archives – Types of archives – features and benefits of CAS – CAS architecture –Objects storage and retrieval in CAS – CAS Examples Storage Virtualization: Forms of Virtualization - SNIA Storage virtualization taxonomy – storage virtualization configurations – storage

virtualization challenges – Types of storage virtualization.

UNIT IV REPLICATION 9

Local replication: Source and target – uses of local replicas – data consistency – local replication technologies – restore and restart considerations – creating multiple replicas – management interfaces – concepts in practice - Remote replications – modes of remote replication technologies – network infrastructure – concepts in practice

UNIT V BUSINESS CONTINUITY 9

Introduction to Business continuity: Information availability – BC terminology – BC planning life cycle – Failure analysis – Business impact analysis – BC technology solutions – concept in practice Backup and Recovery: Backup purpose – considerations – granularity – recovery considerations – backup technologies – concepts in practice

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	EMC Corporation	Information Storage and Management	Wiley India	2010
2.	Jeffrey A. Hoffer, Heikki Topi, V Ramesh	Modern database management	10 Edition, PEARSON	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Robert Spalding	Storage Networks: The Complete Reference	Tata McGraw Hill	2003
2.	Marc Farley	Building Storage Networks	Tata McGraw Hill	2001
3.	Meeta Gupta	Storage Area Networks Fundamentals	Pearson Education Limited	2002
4	Dr. Arun Kumar R	Easy Oracle Automation– Oracle 10g, Automatic Storage	Memory and Diagnostic Features	2004
5	Alex Berson, Larry Dubov	Master Data Management And Data Governance	2/E, Tata McGraw Hill	2011

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COMPUTER SCIENCE AND ENGINEERING

19CSE19	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the importance of total quality management
- To develop students in the role of leadership & employee engagements
- To explore the TQM Tools for defect prevention and data gathering
- To apply the total quality management tools and techniques
- To develop competency in quality system and quality auditing systems

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE19.CO1 Describe the Dimensions and Barriers regarding with Quality
19CSE19.CO2 Illustrate the TQM Principles
19CSE19.CO3 Demonstrate Tools utilization for Quality improvement.
19CSE19.CO4 Summarize the various types of Techniques are used to measure Quality
19CSE19.CO5 Apply various Quality Systems and Auditing on implementation of TQM

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE19.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE19.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE19.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE19.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	x
19CSE19.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM – Customer: Focus, Satisfaction, Complaints, Retention - Costs of quality

UNIT II TQM PRINCIPLES 9

Leadership, Employee Involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous Process Improvement - PDCA cycle - Supplier Partnership - Partnering, Selection, Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The Seven Traditional Tools of Quality - New management tools - Six sigma - Bench marking - FMEA - 5S.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Quality Function Development (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY SYSTEMS 9

ISO 9000 Quality Management Systems: Introduction to ISO, Need for ISO 9000, elements of ISO 9000, quality auditing, types of auditing, ISO 14000: Environmental Management systems: Introduction to ISO 14000, Series of ISO14000, ISO 9000 Vs ISO 14000, Elements of EMS. TQM Implementation in manufacturing and service sectors.

TOTAL: L: 45

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COMPUTER SCIENCE AND ENGINEERING

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dale H. Besterfiled	Total Quality Management	Pearson Education Asia, Third Edition	2006
2.	James R. Evans and William M. Lindsay	Total Quality Management	8th Edition, First Indian Edition, Cengage Learning	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Feigenbaum.A.V	Total Quality Management	McGraw Hill	1991
2.	Oakland.J.S	Total Quality Management Butterworth	Hcinemann Ltd., Oxford	1989
3.	Suganthi.L and Anand Samuel	Total Quality Management	Prentice Hall (India) Pvt. Ltd	2006
4	Janakiraman. B and Gopal .R.K	Total Quality Management – Text and Cases	Prentice Hall (India) Pvt. Ltd.,	2006
5	R.S Naagarazan	Total Quality Management	New Age international,3e	2015

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COMPUTER SCIENCE AND ENGINEERING

19CSE20 **CLOUD INFRASTRUCTURE SERVICES**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To introduce the broad perceptive of cloud architecture and models
- To be familiar with AWS Storage services and Programming
- To understand the importance of AWS Security Services
- To appreciate the emergence of AWS Networking services, Database services
- To use the various types of AWS Services in cloud environment

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE20.CO1	Compare the strengths and limitations of cloud computing models
19CSE20.CO2	Illustrate the fundamental concepts of cloud storage
19CSE20.CO3	Address the core issues of cloud computing such as security, privacy and interoperability
19CSE20.CO4	Deploy applications over commercial cloud computing infrastructures
19CSE20.CO5	Analyze the billing of resources and disaster management

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE20.CO1	x	-	x	-	-	x	x	x	-	x	-	-	x	-	x
19CSE20.CO2	x	x	-	-	-	x	x	x	-	x	-	-	x	x	x
19CSE20.CO3	-	-	x	x	-	x	-	x	-	x	-	x	x	x	-
19CSE20.CO4	x	-	x	-	x	-	-	-	-	x	x	x	x	x	-
19CSE20.CO5	x	-	x	-	x	-	x	x	-	x	-	x	-	x	-

UNIT I CLOUD TECHNOLOGIES AND CLOUD PLATFORMS 9

Introduction to Cloud Computing, History of Cloud computing, Cloud Service options, Cloud Deployment models, Business concerns in the cloud, Exploring virtualization, Load balancing, Hypervisors, Machine imaging, Cloud marketplace overview, Comparison of Cloud providers.

UNIT II PROGRAMMING AND STORAGE WITH AWS 9

Introduction to AWS - AWS history, AWS Infrastructure, AWS services, AWS ecosystem, Programming- Basic Understanding APIs - AWS programming interfaces, Web services, AWS URL naming, Matching interfaces and services, Storage- Elastic block store, Glacier.

UNIT III AWS SECURITY SERVICES AND COMPUTING 9

Users, groups, and roles - Understanding credentials, Security policies, IAM abilities and limitations, AWS physical security - AWS compliance initiatives, Understanding public/private keys, Other AWS security capabilities. AWS computing and marketplace-Elastic cloud compute - Introduction to servers, Imaging computers, Auto scaling, Elastic load balancing, Cataloging the marketplace, AMIs, Selling on the marketplace.

UNIT IV AWS NETWORKING, DATABASES 9

Virtual private clouds, Cloud models, Private DNS servers, Relational database service – DynamoDB, ElastiCache, Redshift.

COMPUTER SCIENCE AND ENGINEERING

UNIT V OTHER AWS SERVICES 9

Services-Analytics services, Application services, Management Services- Cloud security, CloudWatch, CloudFormation, CloudTrail, OpsWorks. AWS billing and Dealing with Disaster- Managing costs, Utilization and tracking, Bottom line impact, Geographic and other concerns, Failure plans, Examining logs.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Barrie Sosinsky	Cloud Computing Bible.	John Wiley & Sons.	2011
2.	Patterns by Thomas Erl	Cloud Computing Design Patterns	Prentice Hall	2015

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bernard Golden	Amazon Web Services For Dummies.	Wiley	2013
2.	Rajkumar Buyya	Cloud Computing: Principles and Paradigms	John Wiley & Sons	2013
3.	Christopher M. Moyer	Building Applications in the Cloud: Concepts, Patterns and Projects	Pearson Addison-Wesley Professional	2011
4	Michael Wittig and Andreas Wittig	Amazon Web Services in Action	Dreamtech Press	2015
5	Francis Shanahan, Wrox	Amazon.com Mashups	Wiley Publishing Inc.,	2007

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COMPUTER SCIENCE AND ENGINEERING

19CSE21	GRPHICS AND MULTIMEDIA	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Demonstrate algorithms in generating graphical outputs.
- Describe 3-dimensional objects using suitable transformations.
- Discuss the architecture for design of multimedia system.
- Familiarize the issues related to multimedia file handling.
- Understand hypermedia standards in developing multimedia applications.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE21.CO1 Develop algorithms to draw fundamental drawings
19CSE21.CO2 Construct real-time rendering 3D graphics
19CSE21.CO3 Design multimedia Application.
19CSE21.CO4 Compress the Multimedia file system
19CSE21.CO5 Integrate Hypermedia components using multimedia message standards

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE21.CO1	x	x	x	-	-	-	-	-	-	-	-	-	x	x	-
19CSE21.CO2	-	x	x	-	-	-	-	x	-	-	-	-	-	x	x
19CSE21.CO3	-	x	x	-	-	-	-	x	-	-	-	-	-	x	x
19CSE21.CO4	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
19CSE21.CO5	-	x	x	x	-	-	-	-	-	-	-	-	-	x	x

UNIT I OUTPUT PRIMITIVES 9

Introduction - Line - Curve and Ellipse Drawing Algorithms – Attributes – Two-Dimensional - Geometric Transformations – Two-Dimensional Clipping and Viewing

UNIT II THREE-DIMENSIONAL CONCEPTS 9

Three-Dimensional Object Representations – Three Dimensional Geometric and Modeling Transformations – Three-Dimensional Viewing – Color models – Animation

UNIT III MULTIMEDIA SYSTEMS DESIGN 9

An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data-interface standards – Multimedia Databases.

UNIT IV MULTIMEDIA FILE HANDLING 9

Compression & Decompression – Data & File Format standards – Multimedia I/O technologies -Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval-Technologies-Multimedia Authoring & User Interface.

UNIT V HYPERMEDIA 9

Hypermedia messaging - Mobile Messaging –Hypermedia message component – Creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed

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Multimedia Systems

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Donald Hearn and M.Pauline Baker	Computer Graphics C	Pearson Education	2007
2.	Prabat K Andleigh and Kiran Thakrar	Multimedia Systems and Design	Prentice- Hall of India	2009

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	James D Foley, Andries van Dam Feiner K , John F Hughes	Computer Graphics: Principles and Practice	Pearson Education	2013
2.	Foley, Vandam, Feiner, Huges	Computer Graphics: Principles & Practice	Pearson Education, second edition	2003
3.	Judith Jeffcoate	Multimedia in practice technology and Applications	Prentice- Hall of India	1998

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COMPUTER SCIENCE AND ENGINEERING

19CSE22 **GRAPHICS AND MULTIMEDIA LABORATORY**

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

- Implement Bresenham's algorithms for line, circle and ellipse drawing.
- Perform 2D trsnsformations on translation, rotation, scaling, refelction, sharing and 2D clipping
- Illustate 3D transformations on translation, rotation, scaling
- Implement text compression, image compression and animation.
- Apply Animation and editing operation on image.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE22.CO1	Illustrate Bresenham's algorithms for line, circle and ellipse drawing.
19CSE22.CO2	Design an algorithm for 2D trsnsformations on translation, rotation, scaling, refelction, sharing and 2D clipping
19CSE22.CO3	Formulate an algorithm for 3D transformations on translation, rotation, scaling
19CSE22.CO4	Implement text compression, image compression and animation
19CSE22.CO5	Apply various color model and editing operation on image

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE22.CO1	x	x	x	-	-	-	-	-	-	-	-	-	x	x	-
19CSE22.CO2	-	x	x	-	-	-	-	x	-	-	-	-	-	x	x
19CSE22.CO3	-	x	x	-	-	-	-	x	-	-	-	-	-	x	x
19CSE22.CO4	x	x	x	-	-	-	-	-	-	-	-	-	x	x	-
19CSE22.CO5	-	x	x	x	-	-	-	-	-	-	-	-	-	x	x

LIST OF PROGRAMS

1. Implement Bresenham's algorithms for line.
2. Implement Bresenham's algorithms for circle and ellipse drawing.
3. Perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
4. Implement Cohen-Sutherland 2D clipping and window-view port mapping.
5. Perform 3D Transformations such as translation, rotation and scaling.
6. Color model conversion.
7. Implement text compression algorithm.
8. Implement image compression algorithm.
9. Perform animation using animation software.
10. Perform basic operations on image using any image editing software.

TOTAL:P:30

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COMPUTER SCIENCE AND ENGINEERING

19CSE23 **DATA WAREHOUSING AND DATA MINING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To Understand the basic Concepts of Data Warehousing.
- To Formulate data mining concepts and understand association rules in mining.
- To Differentiate the types of classification algorithm in data mining.
- To identify the clustering algorithm for various applications.
- To Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE23.CO1 Analyze the concepts of data warehousing.
19CSE23.CO2 Acquire the preprocessing of data and apply mining techniques on it.
19CSE23.CO3 Develop various classification algorithms.
19CSE23.CO4 Organize different types of clustering algorithm.
19CSE23.CO5 Classify web pages, extracting knowledge from the web.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE23.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE23.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE23.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE23.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	x
19CSE23.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I DATA WAREHOUSING 9

Data warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata. Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.

UNIT II DATA MINING 9

Introduction to Data Mining: Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing, Data Cleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation, Data Transformation; Measures of Similarity and Dissimilarity- Basics Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT III CLASSIFICATION 9

Classification: Problem definition, General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision trees-Decision Tree Construction, Methods for expressing attribute test conditions, Measures for Selecting the Best split, Algorithm for Decision tree Induction, Naïve-

Bayes Classifier, Bayesian Belief Networks; K-nearest neighbor classification-Algorithm and characteristics

UNIT IV CLUSTERING 9

Clustering: Problem Definition, Clustering overview, Evaluation of clustering algorithms, Partitioning clustering K-Means Algorithm, K-Means Additional Issues, PAM Algorithm, Hierarchical Clustering-Algorithm-Agglomerative Methods and Divisive Methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and weakness, Outlier Detection

UNIT V TRENDS IN DATA MINING 9

Web and Text Mining: Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining –unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering. Mobile data mining, Location-based data mining, Temporal data mining, Technology, Data mining based on meta data and regulations to dominate data mining.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Alex Berson and Stephen J.Smith	Data Warehousing, Data Mining and OLAP	Tata McGraw – Hill Edition, Thirteenth Reprint	2008
2.	Jiawei Han and Micheline Kamber	Data Mining Concepts and Techniques	Third Edition Elsevier	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Pang-Ning Tan, Michael Steinbach and Vipin Kumar	Introduction to Data Mining	Person Education	2007
2.	K.P. Soman, Shyam Diwakar and V. Aja	Insight into Data Mining Theory and Practice	Eastern Economy Edition Prentice Hall of India	2006
3.	G. K. Gupta	Introduction to Data Mining with Case Studies	Eastern Economy Edition, Prentice Hall of India,	2006
4	Daniel T.Larose	Data Mining Methods and Models	Wiley-Interscience	2006

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COMPUTER SCIENCE AND ENGINEERING

19CSE24 **SOFTWARE QUALITY ASSURANCE** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To understand the basic tenets of software quality, quality factors and Architecture
- To describe how the SQA components can be integrated into the project life cycle.
- To analyze the software quality infrastructure.
- To appraise the management components of software quality.
- Be familiar with IEEE standards, Certifications and Assessments

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE24.CO1 Analyze Software quality factors and components

19CSE24.CO2 Utilize the concepts in SQA Components and software development life cycle.

19CSE24.CO3 Apply the training and certification to check the audit.

19CSE24.CO4 Evaluate the quality of software product.

19CSE24.CO5 Demonstrate their capability to adopt quality standards.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE24.CO1	-	x	-	-	x	-	-	x	-	-	x	-	x	-	-
19CSE24.CO2	x	-	x	x	-	-	x	-	-	-	-	-	-	x	-
19CSE24.CO3	-	-	x	-	-	x	x	-	-	x	-	-	-	-	x
19CSE24.CO4	-	-	-	-	-	x	-	--	x	-	-	x	x	-	-
19CSE24.CO5	x	-	-	-	x	-	-	x	-	x	-	-	-	x	-

UNIT I INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE 9

Need for Software quality – Quality challenges – Software quality assurance (SQA) – Definition and objectives – Software quality factors- McCall"s quality model – SQA system and architecture – Software Project life cycle Components – Pre project quality components – Development and quality plans.

UNIT II SQA COMPONENTS AND PROJECT LIFE CYCLE 9

Software Development methodologies – Quality assurance activities in the development process- Verification & Validation – Reviews – Software Testing – Software Testing implementations – Quality of software maintenance – Pre-Maintenance of software quality components.– Quality assurance tools – CASE tools for software quality – Software maintenance quality – Project Management.

UNIT III SOFTWARE QUALITY INFRASTRUCTURE 9

Procedures and work instructions - Templates - Checklists – 3S development - Staff training and certification Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control – Storage and retrieval.

UNIT IV SOFTWARE QUALITY MANAGEMENT & METRICS 9

Project process control – Computerized tools - Software quality metrics – Objectives of quality measurement – Process metrics – Product metrics – Implementation – Limitations of software metrics – Cost of software quality – Classical quality cost model – Extended model – Application of Cost model.

UNIT V STANDARDS, CERTIFICATIONS & ASSESSMENTS 9

Quality management standards – ISO 9001 and ISO 9000-3 – capability Maturity Models – CMM and CMMI

assessment methodologies - Bootstrap methodology – SPICE Project – SQA project process standards – IEEE Std 1012 & 1028 – Organization of Quality Assurance – Department management responsibilities – Project management responsibilities – SQA units and other actors in SQA systems.

TOTAL : L : 30

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Daniel Galin	Software Quality Assurance	Pearson Publication	2019

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Alan C.Gillies	Software Quality: Theory and Management	International Thomson Computer Press	1997
2.	Mordechai Ben-enachem	Software Quality: Producing Practical Consistent Software	International Thomson Computer Press	1997

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COMPUTER SCIENCE AND ENGINEERING

19CSE25	NETWORK AND ROUTING PROTOCOLS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Understand the transmission media and tools
- Restate about the functions of different network layers
- Create in-depth awareness of packet routing in computer communication networks
- Summarize routing algorithms, Framework and Principles
- Illustrate familiarized with different protocols and Ad hoc Network components

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE25.CO1	Identify the role of each layer in computer networks and its protocols
19CSE25.CO2	Develop the characteristics of distance vector routing protocols
19CSE25.CO3	Describe the critical role routers play in enabling communications across multiple networks
19CSE25.CO4	Evaluate the performance of various routing Framework and Principles
19CSE25.CO5	Apply the characteristics of Routing in Ad hoc Network

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE25.CO1	x	-	x	-	x	-	-	x	-	x	-	x	x	x	-
19CSE25.CO2	x	x	-	-	x	-	-	x	x	x	-	-	x	-	-
19CSE25.CO3	x	x	x	x	-	x	-	-	x	x	x	x	-	x	-
19CSE25.CO4	x	x	x	x	-	x	-	-	x	x	x	-	x	-	x
19CSE25.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I INTRODUCTION 9

Overview: Data Communication - Network Types - Internet History –Topology- Network model: OSI Model - TCP/IP Protocol Suite- Digital Signals - Data rate limits - Performance - Transmission Media: Guided Media- Unguided Media - Repeater and Hub & its type, Bridges and its Types, Switch- Configuration of Switches and Router

UNIT II NETWORK MODEL 9

Description of Seven Layers of OSI Model-TCP/IP Model- Comparison of OSI & TCP/IP Model- Physical and Data link Layer- Network and Transport Layer- Presentation and Session Layer- Application Layer

UNIT III NETWORKING AND NETWORK ROUTING 9

Router Architectures : Functions of a Router- Types of Routers- Elements of a Router- Packet Flow- Packet Processing- Fast Path versus Slow Path, Router Architectures **Addressing and Internet Service:** An Overview-Network Routing-IP Addressing- On Architectures- Service Architecture- Protocol Stack Architecture-Router Architecture- Network Topology Architecture

UNIT IV ROUTING PROTOCOLS FRAMEWORK AND PRINCIPLES 9

Routing Protocol- Routing Algorithm and Routing Information- Representation and Protocol Messages- Distance Vector Routing Protocol- Link State Routing Protocol- Path Vector Routing Protocol-Link Cost- RIP – OSPF – BGP- Multicast Routing-Transport Layer- UDP - Overview of TCP - TCP flow control- TCP Error control - Congestion Control- Quality of Service

UNIT V ROUTING IN AD HOC NETWORK 9

Introduction to Ad hoc Networks – Features/ Characteristics, Types and Applications, Limitations, Advantages and Disadvantages, Classification of Routing Protocols in Ad hoc Networks – Proactive Routing Protocols (DSDV, OLSR), Reactive Routing Protocols (DSR, AODV), Hybrid Routing Protocols (ZRP)

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Behrouz A. Foruzan	Data communication and Networking	Tata McGraw-Hill	2013
2.	Larry L. Peterson and Bruce S. Davie	Computer Networks: A systems approach	Morgan Kaufmann Publishers	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Deepankar Medhi, Kartikeyan Ramasamy	Network Routing – Algorithms, Protocols, Architecture	Morgan Kauffman Series Publication	2010
2.	Andrew S Tanenbaum, David J. Wetherall	Computer Networks	Prentice Hall of India/ Pearson Education	2010
3.	William Stallings	Data and Computer Communications	Pearson Education	2013
4	James F. Kurose, Keith W. Ross	Computer Networking, A Top–Down Approach Featuring the Internet	Pearson Education	2012
5	Dharma Prakash Agrawal and Carlos De Morais Cordeiro	Adhoc and Sensor Networks – Theory and Applications	World Scientific publication	2008

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COMPUTER SCIENCE AND ENGINEERING

19CSE26 **SCALING AND CONNECTING NETWORKS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- State basic concepts as VLAN Technologies
- Describe the concept of Spanning Tree Routing Protocol
- Develop a different types of Routing Protocol
- Evaluate the EIGRP for IPv4, IPv6
- Illustarte the features of OSPF protocols

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE26.CO1 Identify and design the new models for VLAN.
19CSE26.CO2 Develop various Routing Algorithm
19CSE26.CO3 Compare the operations of dynamic Routing Protocol
19CSE26.CO4 Analyze the different models for Network dynamics.
19CSE26.CO5 Configure Shortest Route using OSPF

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE26.CO1	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-
19CSE26.CO2	x	x	-	-	x	-	-	x	x	x	-	-	x	-	-
19CSE26.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-
19CSE26.CO4	x	x	x	x	-	x	-	-	x	x	x	-	x	-	x
19CSE26.CO5	x	-	x	-	x	-	-	x	x	x	-	-	x	-	-

UNIT I INTRODUCTION-VLAN 9

Introduction to LAN Design - Campus Wired LAN Designs -Hierarchical Design Model -Selecting Network Devices-Switch Hardware-Router Hardware-Scaling VLANs-VTP, Extended VLANs, and DTP - VTP Concepts and Operation -VTP Modes-Extended ,VLANs Troubleshoot Multi-VLAN Issues

UNIT II SPANNING TREE 9

STP-Spanning Tree Concepts-Purpose of Spanning Tree--STP Operation-Varieties of Spanning Tree Protocols-Spanning Tree Configuration, Ether Channel and HSRP--First Hop Redundancy Protocols-Link Aggregation Concepts-HSRP Operations-HSRP Failure.

UNIT III ROUTING PROTOCOLS 9

Dynamic Routing-Dynamic Routing Protocols-Types of Routing Protocols-Distance Vector Routing Protocols --Distance Vector Dynamic Routing-Distance Vector Routing Protocol Operation and its types, Link-State Routing Protocols -Link-State Routing Protocol Operation and Benefits

UNIT IV EIGRP TUNING AND TROUBLESHOOTING 9

EIGRP- EIGRP Characteristics- EIGRP Packet Types- EIGRP Messages- EIGRP Operation- Implement EIGRP for IPv4,IPv6- EIGRP Tuning and Troubleshooting

UNIT V OSPF 9

OSPF- OSPF Characteristics- Evolution of OSPF, Features of OSPF -Components of OSPF, OSPF Messages, OSPF Network Types, OSPF Operation, Single-Area OSPF- Differences Between OSPFv2 and OSPFv3- Multiarea OSPF- Multiarea OSPF Operations

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bob Vachon, Allan Johnson	Scaling Networks v6 Companion Guide	Cisco Press	2018
2.	Larry L. Peterson and Bruce S. Davie	Computer Networks: A systems approach	Morgan Kaufmann Publishers	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Deepankar Medhi, Kartikeyan Ramasamy	Network Routing – Algorithms, Protocols, Architecture	Morgan Kauffman Series Publication	2010
2.	Andrew S Tanenbaum, David J. Wetherall	Computer Networks	Prentice Hall of India/ Pearson Education	2010
3.	William Stallings	Data and Computer Communications	Pearson Education	2013
4	James F. Kurose, Keith W. Ross	Computer Networking, A Top–Down Approach Featuring the Internet	Pearson Education	2012
5	Dharma Prakash Agrawal and Carlos De Morais Cordeiro	Adhoc and Sensor Networks – Theory and Applications	World Scientific publication	2008

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COMPUTER SCIENCE AND ENGINEERING

19CSE27	OPEN STACK ESSENTIALS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Understand Open Stack Architecture
- Analyze the Principles of Identity and Image Management
- Define Network and Instance Management
- Develop A Block and Object Storage
- Design and Build Simple Nodes

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE27.CO1 Installing Pack stack and generating an answer file
19CSE27.CO2 Develop Glance as a Registry of images
19CSE27.CO3 Construct Web Interface External Network Setup
19CSE27.CO4 Determine Object file management in the web interface
19CSE27.CO5 Implement interactive Scaling control and Networking Services

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE27.CO1	x	x	-	-	x	-	x	-	-	-	-	-	x	-	-
19CSE27.CO2	-	-	x	-	-	-	x	x	-	-	x	-	-	x	-
19CSE27.CO3	-	-	x	-	x	-	-	-	x	x	-	-	-	-	x
19CSE27.CO4	-	x	-	x	-	x	-	-	x	-	-	x	-	x	-
19CSE27.CO5	x	-	-	x	-	-	-	--	-	x	-	-	-	-	x

UNIT I ARCHITECTURE AND COMPONENT OVERVIEW 9

Open Stack Architecture- Dashboard- Keystone- Glance- Neutron- Nova- Cinder-Shift- Ceilometer- Heat. RDO Installation: Installing RDO using Packstack -Installing Packstack and generating an answer file.

UNIT II IDENTITY AND IMAGE MANAGEMENT 9

Services and Endpoints: Hierarchy of users-roles-Creating an User-Creating an role-Interacting with Keystone in the dashboard-Endpoints in the Dashboard.Glance as a Registry of images -Using the Web Interface-Building an Image.

UNIT III NETWORK AND INSTANCE MANAGEMENT 9

Networking And Neutron-Network Fabric-Open VSwitch Configuration-VLAN –GRE tunnels-VXLAN tunnels-Creating a Network- Web interface Management-External Network access – Preparing a network – Creating an External network-Web Interface External Network Setup. Managing flavors –Managing key pairs – Launching an Instance-Managing floating IP addresses-Managing Security Groups

UNIT IV BLOCK AND OBJECT STORAGE 9

Use case – Creating and using Block Storage – Attaching the block storage to an Instance - Backing Storage – Cinder types.

Object Storage- Use case Architecture of Swift Cluster – Creating and using object storage – Object file management in the web interface – Ring Files.

UNIT V SCALING AND MONITORING 9

Scaling Compute nodes – Control and Networking – Scaling control and Networking Services – Load – Balancing Key

stone – Additional Key stone tuning – Glance Load Balancing.Monitoring – Methods – Commands – Non open stack Service checks – Monitoring control services – Network Services – Compute services – Trouble Shooting.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dan Radez	OpenStack Essentials, Second Edition	Packt Publishing	2015
2.	James Denton	Learning Open Stack Networking, 3 rd Edition	Packt Publishing	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Omar Khedher	Learning Openstack Networking - Third Edition	Packt Publishing	2014
2.	Cody Bumgardner	Open Stack in Action	Packt Publishing	2011
3.	Tom Fifield	Open stack Operations Guide	Packt Publishing	2000

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COMPUTER SCIENCE AND ENGINEERING

19CSE28 **SOFTWARE DEFINED NETWORKS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Define the fundamentals of software defined networks.
- Understand the separation of the data plane and the control plane.
- Describe about the SDN Programming.
- Analyze the various applications of SDN
- Interpret the Framework and their roles in SDN

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE28.CO1 Interpret basic principles of python programming

19CSE28.CO2 Write clear and effective python code

19CSE28.CO3 Create applications using python programming

19CSE28.CO4 Access database using python programming

19CSE28.CO5 Develop web applications using python programming

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE28.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE28.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE28.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE28.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	x
19CSE28.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I INTRODUCTION 9

Basic Packet Switching Terminology - Historical Background - The Modern Data Center - Why SDN? - Genesis of SDN - How SDN Works?

UNIT II OPEN FLOW AND SDN CONTROLLERS 9

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts

UNIT III DATA CENTERS 9

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE.

UNIT IV SDN APPLICATIONS 9

Application Types - A Brief History of SDN Controllers - Controller Considerations - Network Device Considerations -Offloading Flows in the Data Center - Access Control for the Campus

UNIT V SDN 9

Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Paul Goransson and Chuck Black	Software Defined Networks: A Comprehensive Approach	First Edition, Morgan Kaufmann	2014
2.	Thomas D. Nadeau, Ken Gray	SDN: Software Defined Networks	OReilly Media	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Siamak Azodolmolky	Software Defined Networking with Open Flow	Packet Publishing	2013
2.	Vivek Tiwari	SDN and Open Flow for Beginnersll	Amazon Digital Services	2013
3.	Fei Hu, Editor	Network Innovation through Open Flow and SDN: Principles and Design	CRC Press	2014

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COMPUTER SCIENCE AND ENGINEERING

19CSE29	DOCKER AND KUBERNETES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Understand the basic concepts of Kubernetes
- Illustrate Network And data Management using containers
- Develop a Docker Essential
- Evaluate kubernetes on AWS and Google cloud platforms
- Deploy stateful and stateless apps on the cluster

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE29.CO1	Installing & creating an account with docker Hub
19CSE29.CO2	Summarize the interactive Scaling control and Networking Services using docker
19CSE29.CO3	Expose the Build Comprehensive Hands-on with Kubernetes Components
19CSE29.CO4	Organize Kubernetes Cluster installation on Virtualbox, AWS & Google Cloud Platforms
19CSE29.CO5	Develop interactive app outside the cluster and to autoscale apps

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE29.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE29.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE29.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE29.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	x
19CSE29.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I INTRODUCTION 9

Introduction to Docker-requirements –Docker containers-listing-searching-pulling for an image-Starting containers-listing containers-stopping containers, deleting containers-setting and getting privileged access inside a container- run container images in Kubernetes-injecting new process to a running container-labelling filtering containers.

UNIT II NETWORK AND DATA MANAGEMENT FOR CONTAINERS 9

Introduction-Accessing containers from outside-Managing data in containers-linking two or more containers-LAMP-application by linking containers-networking of multihost containers with Flannel-Assigning IPv6 addresses to containers.

UNIT III DOCKER PERFORMANCE AND ORCHESTRATION 9

Introduction-Benchmarking CPU performance, Benchmarking disk performance, Benchmarking network performance-Performance monitoring. Orchestration-Introduction-Applications with docker compose-cluster with docker Swarm-CoreOS for docker Orchestration-docker in project atomic.

UNIT IV INTRODUCTION TO KUBERNETES 9

Introduction- Kubernetes Architecture- Components of kubernetes cluster - cluster management - Deploy Kubernetes- deploy Kubernetes on AWS and Google cloud platforms- Pods and Deployments -Kubernetes Master- master nodes.

UNIT V KUBERNETES USING DOCKER 9

Kubernetes Management Design Patterns with Docker, CoreOS Linux- Kubernetes docker containers-Nodes-Cluster-Service-pod-Replication controller-label-selector-name-namespace-volume-Service proxy-listing service-listing nodes- Kubernetes Cluster-Scaling-Testing-wordpress with kubernetes cluster.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Deepak Vohra	Kubernetes Microservices with Docker	Apress	2016
2.	Neependra Khare	Docker Cookbook	Packt Publishing	2015

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Deepak Vohra	Kubernetes Management Design Patterns	Apress	2017
2.	Ed Robinson	Kubernetes on AWS	Packt Publishing	2018
3.	Karl Matthias, Sean P. Kane	Docker: Up and Running	O'Reilly Media	2015

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COMPUTER SCIENCE AND ENGINEERING

19CSE30 **BLOCK CHAIN** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To Understand the emerging abstract models for Blockchain Technology.
- Analyze the mechanism of digital money and Cryptography
- Summaries the necessary bitcoin and cryptocurrency background.
- Apply the function of initial coin offerings
- Implement the Applications of Block chain

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE30.CO1 Understand the use cases in Block Chain

19CSE30.CO2 Demonstrate the digital transaction in same and different bank.

19CSE30.CO3 Implement the Bitcoin transactions.

19CSE30.CO4 Summarizes the functions of bitcoin and make use of it to solve problems

19CSE30.CO5 Demonstrates the foundations with Decentralized Applications

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE30.CO1	x	x	x	-	x	-	-	-	-	x	-	-	x	-	x
19CSE30.CO2	-	-	-	x	x	x	x	-	-	-	-	x	-	x	x
19CSE30.CO3	x	-	x	x	-	-	x	x	-	-	-	-	x	x	-
19CSE30.CO4	-	x	-	-	-	x	x	-	-	-	x	x	-	x	x
19CSE30.CO5	-	-	x	-	-	-	-	-	x	x	x	x	-	x	x

UNIT I INTRODUCTION TO BLOCKCHAIN 9

Centralized vs. Decentralized Systems- Layers of Blockchain- Importance of Blockchain- Limitations of Centralized Systems- Blockchain Adoption- Blockchain Uses and Use Cases- Laying the Blockchain Foundation- Cryptography- Game Theory- Properties of Blockchain Solutions- Blockchain Applications

UNIT II DIGITAL MONEY AND CRYPTOGRAPHY 9

Interbank Payments-Same bank- diffferent banks- Correspondent Bank Accounts- Central Bank Accounts- International Payments- E-Money Wallets-Cryptography- Encryption and Decryption- Hashes-Digital Signatures- Alice and Bob

UNIT III BITCOIN AND CRYPTOCURRENCY 9

A basic crypto currency-Creation of coins- Bitcoin -Working with Bitcoins- The Bitcoin Blockchain- Block Structure, The Genesis Block- The Bitcoin Network- Network Discovery for a New Node, Bitcoin Transactions, Consensus and Block Mining, Block Propagation- Bitcoin Scripts

UNIT IV INITIAL COIN OFFERINGS AND INVESTING 9

ICOs- Whitepapers- The Token Sale- ICO Funding Stages- Whitelisting- Funding Caps- Treasury-Exchange Listing- Pricing-Price utility tokens- Risks and Mitigations- Market Risk-Liquidity Risk-Exchange Risks-Wallet Risks-Regulatory Risks-Scams

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UNIT V BLOCKCHAIN APPLICATIONS 9

Foundations of Blockchain- Transaction Workflow, Simple Payment Verification, Blockchain Forks- Unpacking Ethereum- Overview- Ethereum Virtual Machine- Decentralized Applications- Decentralized Organizations- Blockchain in Science, Reproducibility Crisis, Clinical Trials, Reputation System, Pharmaceutical Drug Tracking

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bikramaditya Singhal Priyansu Sekhar Panda Gautam Dhameja	Beginning Blockchain-A Beginner's Guide to Building Blockchain Solutions	Apress	2018
2.	Antony lewis	The Basics of Bitcoins and Blockchains	Mango Publishing Group	2018
3.	Vikram Dhillon , David Metcalf, Max Hooper	Blockchain Enabled Applications-Understand the Blockchain Ecosystem and How to Make it Work for You	Apress	2017

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bashir, Imran	Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks	Springer	2017
2.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder	Bitcoin and cryptocurrency technologies: a comprehensive introduction	Princeton University Press	2016
3.	Joseph Bonneau	SoK: Research perspectives and challenges for Bitcoin and cryptocurrency	IEEE Symposium on security and Privacy	2015

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COMPUTER SCIENCE AND ENGINEERING

19CSE31	USER CENTRIC DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Provide a problem setting, critically discuss the appropriateness of potential design methods such as contextual design, prototyping, ideation, etc.
- Describe the challenges to achieving a human-centered design process.
- Restate useful information about users and activities through observation or systematic in-quiry.
- Analyze the design of standards, guidelines, and patterns of UCD
- Create a prototype for a small system and plan and perform a usability evaluation.

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE31.CO1	Evaluate an appreciation for the theory and sensibilities of user-centered design
19CSE31.CO2	Illustrate skills in the use and application of a variety of design methods, specifically applicable to user-centered design
19CSE31.CO3	Utilize individual and collaborative skills in design-based problem solving
19CSE31.CO4	Develop UCD is an Iterative process
19CSE31.CO5	Analyze Multidisciplinary Design Teams for User Centered Design

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE31.CO1	-	x	-	-	x	-	-	x	-	-	x	-	x	-	-
19CSE31.CO2	x	-	x	x	-	-	x	-	-	-	-	-	-	x	-
19CSE31.CO3	-	-	x	-	-	x	x	-	-	x	-	-	-	-	x
19CSE31.CO4	-	-	-	-	-	x	-	--	x	-	-	x	x	-	-
19CSE31.CO5	x	-	-	-	x	-	-	x	-	x	-	-	-	x	-

UNIT I USER CENTERED DESIGN OVERVIEW 9

User centered Design- UCD Principle - Iterative Process-Phases of the design process—Investigative Methods and Tools- Example: Brainstorming- Apply User Centered Design – Understand context of use – Specify user Requirements – Design Solutions – Evaluate against requirements – Hardware UCD - Working with Users.

UNIT II MULTIDISCIPLINARY DESIGN TEAMS 9

Multidisciplinary Design Teams for User Centered Design: Engineer-Designer-Researcher- Marketer – Stakeholder – Investment in UCD Pays off – Benefits of User centered Design – Approach of User centered Design – UX and Interactive Design. Design Principle : Hick's Law – Fitt's Law – Visibility – Visual Feedback – Gestalt Principle – Mobile UCD – UCD Terms.

UNIT III ESTABLISHING A BASELINE ABOUT UCD 9

Introduction to UCD – UCD and User Experience – User Experience versus User Interface – UX is more than a Buzz word – User Research – Interviews – Surveys – Focus Groups – Observational Usability Research – Scenarios - UCD Process –Storyboards - Creating a personal Manifesto – Balance and Filter Design Features – MVP

UNIT IV USER CENTRIC TOOLS AND TECHNIQUES 9

Introduction to UCD Tools and Techniques – Activity: Personas and Target Audience – UX One sheet – Journey Mapping – Wire framing – Ideation –Prototyping – Evaluation – Design specification - Sketching: Open ended vs Highly Constrained Sketching – Scribble Sketching – Stretch your imagination – Combining

Sketching with images – Final Reflection – Pendo – Survey Monkey- Axure – POP – Silverback

UNIT V ITRENDS IN UCD 9

Personalization - Material design - Designing for content - Designing for content - Animation and micro-interactions - Accessible design - AI for testing design options and making decisions - Data and design collaboration - Minimalistic Simple Designs - Stellar 3D Animation & Graphic – RIDE (Report – Iterate – Deploy – Evaluate.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Travis Lowdermilk	User-Centered Design: A Developer's Guide to Building User-Friendly Applications, First Edition	O'Reilly Media	2013
2.	Brian Still and Kate Crane	Fundamentals of User-Centered Design: A Practical Approach	CRC Press	2016

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Elizabeth F. Churchill, Frank Ritter, and Gordon D. Baxter	Foundations for Designing User-Centered Systems: What System Designers Need to Know about People	Springer	2014
2.	Amir Shevat	Designing Bots: Creating Conversational Experiences	O'Reilly Media	2017
3.	Westley Knight	UX for Developers: How to Integrate User-Centered Design Principles Into Your Day-to-Day Development Work	Apress	2018

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COMPUTER SCIENCE AND ENGINEERING

19CSE32	NODE.JS AND REACT.JS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn the runtime web development for easily building fast and scalable network applications.
- To enhance the knowledge in event-driven and real-time applications that run across distributed devices.
- To learn the streams and file systems in Node Js
- To acquire the knowledge on web development and database connectivity
- To Acquire the knowledge of MVC template on user interfaces using React JS

COURSE OUTCOMES:

At the end of the course, the students will able to

19CSE32.CO1 Examine the fundamental structure of Node.js platform
19CSE32.CO2 Affirm the concepts of NPM
19CSE32.CO3 Interpret the concepts of streams and file systems
19CSE32.CO4 Develop the web content using node.js
19CSE32.CO5 Annotate the various features of React js

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19CSE32.CO1	x	-	x	x	-	-	x	-	-	x	-	x	x	x	-
19CSE32.CO2	x	x	-	-	x	-	x	x	x	x	-	-	x	-	-
19CSE32.CO3	x	x	x	x	-	x	-	-	x	x	x	x	x	-	-
19CSE32.CO4	x	x	x	-	x	x	-	x	x	x	x	-	-	-	x
19CSE32.CO5	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I INTRODUCTION TO NODE.JS 9

The environment of Node.js - Benefits and Features - Install Node.js on Windows - Console and Web programs - Node.js REPL Commands

UNIT II NPM 9

Node.js Package Manager - Installing modules using NPM - Node.js Command Line Options - Node.js Errors - Node.js DNS - Node.js Net

UNIT III STREAMS AND FILE SYSTEMS 9

Node.js Creating Buffers - Node.js Streams - Node.js Piping Streams - Node.js Chaining Streams - Node.js File Systems

UNIT IV WEB DEVELOPMENT 9

Node.js Web Module - Node.js html form handling - Node.js Database Connectivity

UNIT V INTRODUCTION TO REACT.JS 9

The environment of React.js - Benefits and Features – components – state – lifecycle – events – forms – CSS

TOTAL: L: 45

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	AzatMardan	Practical Node. jsBuilding Real-World Scalable Web Apps,	APRESS Publication	2018

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Alex Young, Bradley Meck, Mike Cantelon	Node.js in Action	Manning Publications	2017
2.	Alex banks & Eve Porcello	Learning React	O'Reilly Publications	2017

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