MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

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

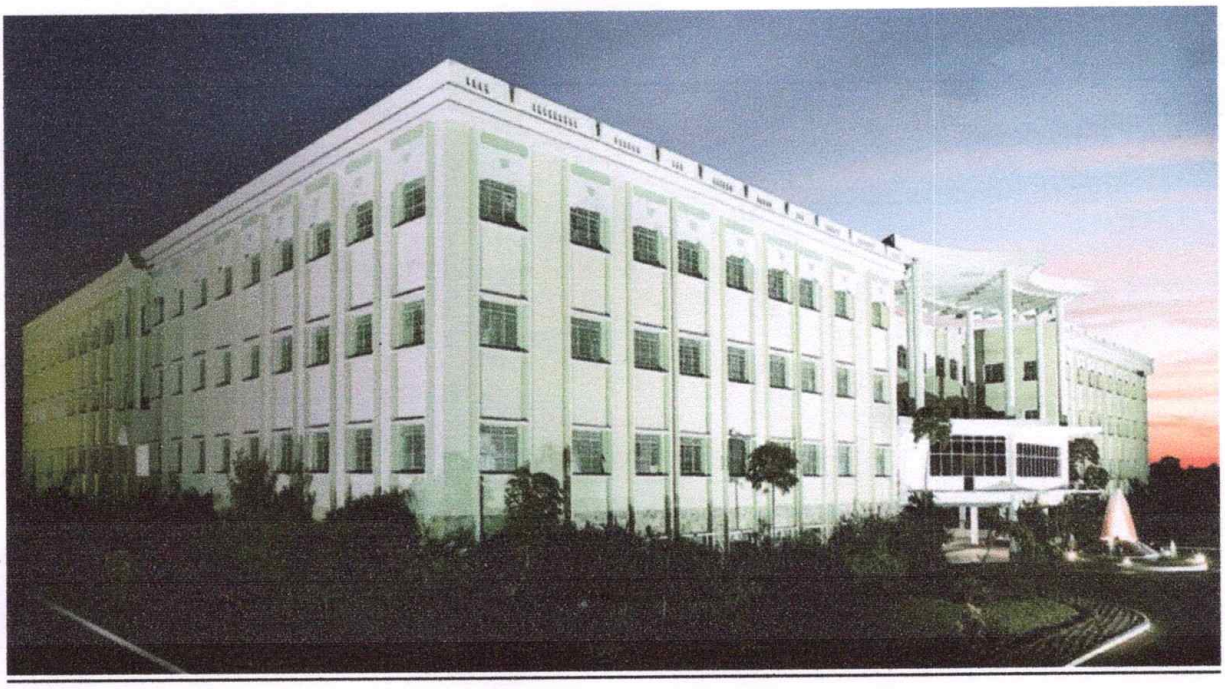
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

Curriculum/Syllabus

Programme Code : AD

Programme Name : B.TECH- ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Regulation : R-2019



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Rasipuram - 637 408, Namakkal Dt, Tamil Nadu.

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

Estd. 2000

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 create an inspirational learning centre where proficient and future-ready scientist in the field of Artificial Intelligence and Data Science

DEPARTMENT MISSION

- To impart high-quality education and capitalist oriented learning through Artificial Intelligence and Data Science.
- To contribute towards advanced AI technologies that provides increased and better performance.
- To benefit the society through our contribution towards advancements in AI and Data Science

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DEPARTMENT PROGRAM EDUCATIONAL OBJECTIVES, PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES

PROGRAM EDUCATIONAL OBJECTIVES

The Artificial Intelligence and Data Science 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

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **Design/Development 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.
4. **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.
5. **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.

6. **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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering 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.
12. **Lifelong learning:** Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: Graduates should be able to design and analyze the Artificial Intelligence algorithms towards Contemporary technology

PSO2: Graduates should be able to apply probability and statistical solutions for real time problems towards data science

PSO3: Graduates should be able to create an intelligent system by understanding modern coding tools, data analytics and digital business.

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Rasipuram- 637408, NamakkalDist.,TamilNadu

B.Tech – Artificial Intelligence and Data Science

GROUPING OF COURSES

1. 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

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
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 DifferentialEquations	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	1	0	4
19.	19BSS27	Probability and Random Processes	BS	4	3	1	0	4
20.	19BSS28	Statistic and Numerical Methods	BS	4	3	1	0	4

3. 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 SolvingUsing C	GES	3	3	0	0	3
2	19GES02	Programming for Problem SolvingTechnique	GES	3	3	0	0	3
3	19GES03	Programming in C Laboratory	GES	2	0	0	2	1
4	19GES04	Programming in C and PythonLaboratory	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 SciencesLaboratory	GES	2	0	0	2	1
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 ControlLaboratory	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 DesignLaboratory	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 MicroprocessorLaboratory	GES	2	0	0	2	1
32	19GES32	Data Structures using Python	GES	3	3	0	0	3

4. Professional Core Courses (PC)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	19ADC01	Data Structures and Files	PC	3	3	0	0	3
2.	19ADC02	Data Structures Lab Using C++	PC	2	0	0	2	1
3.	19ADC03	Processor Architecture	PC	3	3	0	0	3
4.	19ADC04	Processor Architecture Lab	PC	2	0	0	2	1
5.	19ADC05	Introduction to Data Science	PC	3	3	0	0	3
6.	19ADC06	Object Oriented Programming	PC	3	3	0	0	3
7.	19ADC07	Operating System	PC	3	3	0	0	3
8.	19ADC08	Operating System Lab	PC	2	0	0	2	1
9.	19ADC09	Design and Analysis of Algorithms	PC	3	3	0	0	3
10.	19ADC10	Database Design and Management	PC	3	3	0	0	3
11.	19ADC11	Database Design and Management Laboratory	PC	2	0	0	2	1
12.	19ADC12	Artificial Intelligence I	PC	3	3	0	0	3
13.	19ADC13	Artificial Intelligence I Laboratory	PC	2	0	0	2	1
14.	19ADC14	Data Analytics	PC	3	3	0	0	3
15.	19ADC15	Data Analytics Laboratory	PC	2	0	0	2	1
16.	19ADC16	Cognitive Systems	PC	3	3	0	0	3
17.	19ADC17	Optimization Techniques	PC	3	3	0	0	3
18.	19ADC18	Data Exploration and Visualization	PC	3	3	0	0	3
19.	19ADC19	Machine Learning	PC	3	3	0	0	3
20.	19ADC20	Machine Learning Laboratory	PC	2	0	0	2	1
21.	19ADC21	Business Analytics	PC	3	3	0	0	3
22.	19ADC22	Internet Programming and Web Technologies	PC	3	3	0	0	3
23.	19ADC23	Internet Programming and Web Technologies Laboratory	PC	2	0	0	2	1
24.	19ADC24	Artificial Intelligence II	PC	3	3	0	0	3
25.	19ADC25	Artificial Intelligence - II Laboratory	PC	2	0	0	2	1
26.	19ADC26	Data and Information Security	PC	3	3	0	0	3
27.	19ADC27	Deep Learning	PC	3	3	0	0	3
28.	19ADC28	Deep Learning Laboratory	PC	2	0	0	2	1

29.	19ADC29	AI and Robotics	PC	3	3	0	0	3
30.	19ADC30	Computer Vision	PC	3	3	0	0	3
31.	19ADC31	Mini Project on Data Sciences Pipeline	PC	4	0	0	4	2

5. Professional Elective Courses (PE)

S. No	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	19ADE01	Software Development Processes	PE	3	3	0	0	3
2	19ADE02	Microprocessors and Microcontrollers	PE	3	3	0	0	3
3	19ADE03	Engineering Predictive Analytics	PE	3	3	0	0	3
4	19ADE04	Agile Methodologies	PE	3	3	0	0	3
5	19ADE05	Parallel Computing	PE	3	3	0	0	3
6	19ADE06	Software Architecture	PE	3	3	0	0	3
7	19ADE07	Internet of Things	PE	3	3	0	0	3
8	19ADE08	Health care Analytics	PE	3	3	0	0	3
9	19ADE09	Distributed Systems	PE	3	3	0	0	3
10	19ADE10	Mobile Applications Development	PE	3	3	0	0	3
11	19ADE11	Software Testing and QualityAssurance	PE	3	3	0	0	3
12	19ADE12	Cloud Computing	PE	3	3	0	0	3
13	19ADE13	Embedded Systems andProgramming	PE	3	3	0	0	3
14	19ADE14	Operations and Supply ChainManagement	PE	3	3	0	0	3
15	19ADE15	Speech Processing and Analytics	PE	3	3	0	0	3
16	19ADE16	Social Network Analytics	PE	3	3	0	0	3
17	19ADE17	Cyber Security	PE	3	3	0	0	3
18	19ADE18	Web Services and API Design	PE	3	3	0	0	3
19	19ADE19	Nonlinear Optimization	PE	3	3	0	0	3
20	19ADE20	Ethics of AI	PE	3	3	0	0	3
21	19ADE21	Engineering Economics	PE	3	3	0	0	3
22	19ADE22	Python for Data Science	PE	3	3	0	0	3
23	19ADE23	Python Laboratory	PE	2	0	0	2	1
24	19ADE24	Data Warehousing and Mining	PE	3	3	0	0	3
25	19ADE25	Cognitive Science and Analytics	PE	3	3	0	0	3
26	19ADE26	Big Data Analytics	PE	3	3	0	0	3
27	19ADE27	Big Data Analytics Laboratory	PE	2	0	0	2	1
28	19ADE28	Block Chain and Cryptography	PE	3	3	0	0	3
29	19ADE29	Principles of Management	PE	3	3	0	0	3

30	19ADE30	IOT System And Analytics	PE	3	3	0	0	3
31	19ADE31	IOT System And Analytics Laboratory	PE	2	0	0	2	1
32	19ADE32	Bio-inspired Optimization Techniques	PE	3	3	0	0	3
33	19ADE35	Information Extraction and Retrieval	PE	3	3	0	0	3
34	19ADE36	Data Security and Privacy	PE	3	3	0	0	3
35	19ADE37	Adhoc and Sensor Networks	PE	3	3	0	0	3
36	16ADE38	Digital Image Processing	PE	3	3	0	0	3

6. Employability Enhancement Courses (EE)

S. No	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	19ADP01	Project work-Phase I	EC	6	0	0	6	3
2	19ADP02	Project work-Phase II	EC	15	0	0	15	12
3	19ADP03	Comprehension	EC	4	0	0	4	2
4	19ADP04	Technical Seminar	EC	4	0	4	0	2
5	19ADP05	Entrepreneurship Development	EC	3	3	0	0	3
6	19ADP06	Professional Practices	EC	6	0	0	6	3
7	19ADP07	NPTEL- Introduction to Industry 4.0and Industrial Internet of Things	EC	-	-	-	-	-
8	19ADP08	NPTEL- Introduction to MachineLearning	EC	-	-	-	-	-
9	19ADP09	NPTEL- The Joy of Computingusing Python	EC	-	-	-	-	-
10	19ADP10	NPTEL-Data Analytics withPython	EC	-	-	-	-	-
11	19ADP11	Indian Constitution	EC	-	-	-	-	-
12	19ADP12	Value Education	EC	-	-	-	-	-
13	19ADP13	Disaster Management	EC	-	-	-	-	-
14	19ADP14	Pedagogy Studies	EC	-	-	-	-	-
15	19ADP15	Stress Management by Yoga	EC	-	-	-	-	-

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Department	Artificial Intelligence and Data Science
Programme	B.Tech

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	Artificial Intelligence and Data Science
Programme	B.Tech

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**	

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Department	Artificial Intelligence and Data Science
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SEMESTER – III

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19ADC01	Data Structures and Files	3	0	0	3	3
2.	19ADC03	Processor Architecture	3	0	0	3	3
3.	19ADC05	Introduction to Data Science	3	0	0	3	3
4.	19BSS23	Transforms and Partial Differential Equations	3	1	0	4	4
5.	19ADC06	Object Oriented Programming	3	0	0	3	3
6.	19ADC07	Operating Systems	3	0	0	3	3
PRACTICALS							
7.	19ADC04	Processor Architecture Lab	0	0	2	1	2
8.	19ADC02	Data Structures Lab using C++ Laboratory	0	0	2	1	2
9.	19ADC08	Operating Systems Lab	0	0	2	1	2
		Total Credits				**22**	

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Department	Artificial Intelligence and Data Science
Programme	B.Tech

SEMESTER – IV

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19ADC09	Design and Analysis of Algorithms	3	0	0	3	3
2.	19ADC10	Database Design and Management	3	0	0	3	3
3.	19ADC12	Artificial Intelligence I	3	0	0	3	3
4.	19ADC14	Data Analytics	3	1	0	4	4
5.	19ADC16	Cognitive Systems	3	0	0	3	3
6.	PE	Professional Elective I	3	0	0	3	3
PRACTICALS							
7.	19ADC11	Database Design and Management Laboratory	0	0	2	1	2
8.	19ADC13	Artificial Intelligence I Laboratory	0	0	2	1	2
9.	19ADC15	Data Analytics Laboratory	0	0	2	1	2
		Total Credits				**22**	

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Programme	B.Tech

SEMESTER – V

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19ADC17	Optimization Techniques	3	0	0	3	3
2.	19ADC18	Data Exploration and Visualization	3	0	0	3	3
3.	19ADC19	Machine Learning	3	0	0	3	3
4.	19ADC21	Business Analytics	3	0	0	3	3
5.	PE	Professional Elective II	3	0	0	3	3
6.	OE	Open Elective- I	3	0	0	3	3
PRACTICALS							
7.	19ADC20	Machine Learning Lab	0	0	3	1	3
8.	19ADC31	Mini Project on Data Sciences Pipeline	0	0	4	2	4
		Total Credits				**21**	

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Department	Artificial Intelligence and Data Science
Programme	B.Tech

SEMESTER – VI

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19ADC22	Internet Programming and Web Technologies	3	0	0	3	3
2.	19ADC24	Artificial Intelligence II	3	0	0	3	3
3.	19ADC26	Data and Information Security	3	0	0	3	3
4.	19ADC27	Deep Learning	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.	19ADC23	Internet Programming and Web Technologies	0	0	2	1	2
8.	19ADC25	Artificial Intelligence - II Laboratory	0	0	2	1	2
9.	19ADC28	Deep Learning Lab	0	0	2	1	2
		Total Credits				**21**	

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Department	Artificial Intelligence and Data Science
Programme	B.Tech

SEMESTER – VII

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19ADC29	AI and Robotics	3	0	0	3	3
2.	19ADC30	Computer Vision	3	0	0	3	3
3.	PE	Elective-IV	3	0	0	3	3
4.	PE	Elective-V	3	0	0	3	3
5.	PE	Elective-VI	3	0	0	3	3
6.	OE	(OE- III)	3	0	0	3	3
PRACTICALS							
7.	19ADP01	Project work-Phase I	0	0	6	3	6
		Total Credits				**21**	

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Department	Artificial Intelligence and Data Science
Programme	B.Tech

SEMESTER – VIII

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.		Mandatory Course(NPTEL)	-	-	-	-	-
PRACTICALS							
2.	19ADP02	Project work-Phase 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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19ADC01 **DATA STRUCTURES AND FILES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To understand the basic concepts of data structures and files
2. To develop concepts about stacks, queues, lists, trees and graphs
3. To choose and implement the appropriate data structure for a specific application
4. To solve different applications using various data structures and file organization
5. To understand concepts about searching and sorting techniques

COURSE OUTCOMES

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

19ADC01.CO1 Apply and implement linear data structure
19ADC01.CO2 Apply different nonlinear data structures.
19ADC01.CO3 Implement variants of different tree data structure.
19ADC01.CO4 Analyze and implement variants of graph data structure using hashing.
19ADC01.CO5 Analyze searching, sorting and file technique

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC01.CO1	X	-	X	X	-	X	-	X	X	-	X	X	X	-	-
19ADC01.CO2	X	X	-	X	-	-	X	X	X	X	-	-	-	X	X
19ADC01.CO3	X	-	X	-	X	X	-	X	-	X	X	X	-	-	-
19ADC01.CO4	X	X	X	X	-	-	X	-	-	X	-	-	-	X	X
19ADC01.CO5	X	X	-	X	X	X	-	-	-	-	X	-	X	-	-

UNIT I INTRODUCTION 9

Data Structure Operations: insertion, deletion, traversal etc.; Abstract Data Types (ADTs) : List ADT – Array-based implementation Linked list implementation - Singly linked lists - Circularly linked lists - Doubly-linked lists – Applications of lists – PolynomialManipulation.

UNIT II LINEAR DATA STRUCTURES 9

Stack ADT – Operations – Applications – Evaluating arithmetic expressions - Conversion of Infix to postfix expression – Queue ADT Operations – Circular Queue – Double ended queue – Applications of queues.

UNIT III NON LINEAR DATA STRUCTURES 9

Trees : Traversals – Binary Trees – Expression trees – Applications of trees – Binary search trees - AVL Trees – B-Tree – Heap –Applications of heap -Tries

UNIT IV GRAPHS 9

Graphs : Representation of graph – Graph traversals – Breadth-first traversal – Depth-first traversal – Minimum Spanning Trees: Prim's algorithm, Kruskal's algorithm – Shortest path algorithms: Dijkstra's algorithm, Floyd Warshall algorithm - Applications of Graphs: Topological Sort

UNIT V SEARCHING, SORTING, HASHING TECHNIQUES AND FILES 9

Searching : Linear Search – Binary Search, Sorting : Bubble sort – Selection sort – Insertion sort – Merge sort, Hashing : Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing . Files And Their Organization : File Storage Concepts - Sequential Access Method (SAM) - Indexed Sequential Access Method (ISAM) - Direct Access Method (DAM)

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Mark Allen Weiss	Data Structures and Algorithm Analysis in C++	Pearson Education	2014

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	D.S. Malik	Data Structures Using C++	Cengage	2012
2.	Yedidyah Langsam, Moshe J Augenstein and Aaron M Tanenbaum,	Data Structures using C and C++	Prentice Hall of India/Pearson Education	2006
3.	Sartaj Sahni	Data Structures, Algorithm and Application in C++	Universities Press	2005
4.	Michael T.Goodrich, R.Tamassiaand Mount	Data structures and Algorithms in C++	Wiley	2016

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Department	Artificial Intelligence and Data Science
Programme	B.Tech

SEMESTER – VII

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	19ADC29	AI and Robotics	3	0	0	3	3
2.	19ADC30	Computer Vision	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.	19ADP01	Project Work I	0	0	6	3	6
		Total Credits				**21**	

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Department	Artificial Intelligence and Data Science
Programme	B.Tech

SEMESTER – VIII

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.		Mandatory Course(NPTEL)	-	-	-	-	-
PRACTICALS							
2.	19ADP02	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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19ADC02 **DATA STRUCTURES USING C++ LABORATORY** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

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

COURSE OUTCOMES

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

19ADC02.CO1 Classify various operations on singly and doubly linked list
19ADC02.CO2 Illustrate stack programs using C++
19ADC02.CO3 Apply the concept of queue using an array
19ADC02.CO4 Develop binary search tree and B-tree
19ADC02.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
19ADC02.CO1	X	-	X	X	-	X	-	X	X	-	X	X	X	-	-
19ADC02.CO2	X	X	-	X	-	-	X	X	X	X	-	-	-	X	X
19ADC02.CO3	X	-	X	-	X	X	-	X	-	X	X	X	-	-	-
19ADC02.CO4	X	X	X	X	-	-	X	-	-	X	-	-	-	X	X
19ADC02.CO5	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 agiven 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 ofelements. 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
6. Write a C++ program that uses function templates to perform the following: a) Search for a key element in a list ofelements 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 template based C++ program that implements Quick sort algorithm to arrange a list of elements in ascendingorder.
10. Write a C++ program that implements Heap sort algorithm for sorting a list of integers in ascending order
11. Write a C++ program that implements Merge sort algorithm for sorting a list of integers in ascending order

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19ADC03 **PROCESSOR ARCHITECTURE** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To Understand the Architecture of 80X86 Processors, Bus Operations , Memory Organization
2. To Learn Assembly Level Language programming
3. To Acknowledge Memory management techniques
4. To Explain Multitasking, Interrupts, Exceptions and I/O operations
5. To State Microcontroller design and operations

COURSE OUTCOMES

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

19ADC03.CO1 Explain the Architecture of 80X86 Processors, Bus Operations , Memory Organization
19ADC03.CO2 Develop Assembly Level Language Programs
19ADC03.CO3 Describe Memory Management Techniques
19ADC03.CO4 State Multitasking, Interrupts, Exceptions and I/O operations
19ADC03.CO5 Implement applications using microcontroller

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC03.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19ADC03.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC03.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC03.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19ADC03.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT- I INTRODUCTION TO 80X86 PROCESSORS **9**

16/32bit processor 80x86, 80386 Features and Architecture, Pin Description, Functional Description, Register Set , 80386 Real mode, Segmentation, Bus Cycles Initialization and configuration, Bus operations , Address pipelined, Memory organization and I/O organization, 16/32 bit transfer.

UNIT- II ASSEMBLY LANGUAGE PROGRAMMING **9**

Introduction to assembly language programming, Instruction set, Assembler, linker, loader, concepts, Assembler directives, file I/O processing, Far and near procedures, macros, Timing and delay loops, DOS internal, DOS calls, .EXE, .COM files, Interfacing with 8086: Programmable parallel ports, 8255 A PPI, interfacing, keyboard & display, parallel printer interface, interfacing RAM.

UNIT- III MEMORY MANAGEMENT **9**

Segmentation- support registers, related instructions descriptors, memory management through segmentation, logical to linear/physical address translation, protection in segmentation, Privilege instructions. Paging - support registers, descriptors, linear to physical address translation, TLB, page level protection, virtual memory, .entering into PM mode and returning back to RM mode

UNIT- IV MULTITASKING, INTERRUPTS, EXCEPTIONS AND I/O **9**

Inter-privilege level transfer using Call gates and confirming code segment, Multitasking - Support registers, related descriptors, Task switching, I/O permission bit map. Virtual Mode - features, address generation, privilege level, instructions and registers available, entering and leaving V86 mode. Interrupt structure - Real, Protected and Virtual 8086 modes, Comparison of all three modes

UNIT- V MICROCONTROLLER **9**

Microcontroller 8051 Architecture, On-Chip data memory and program memory organization - Register set, Register bank, SFRs, External data memory and program memory, Interrupts structure and Response. Timers and their programming, Serial port and programming, Other features, Design of minimum system using 8051 micro-controller for various applications. Features of PIC 16C, PIC 16F8XX ,Texas MSP 430.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hennessy, J.L.; Patterson, D.A,Elsevier/Morgan Kaufmann	Computer architecture: a quantitativeapproach	Cambridge, MA : Elsevier	2019
2.	Johnson, M, Prentice Hall	Superscalar microprocessor design	Prentice Hall	1991
3.	James Turley	"Advanced 80386 Programming Techniques	McGraw Hill Education	2005

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Adrian Fernandez	Getting Started with the MSP430 Launchpad	Newness publication	2013
2.	John H. Davies	MSP430 microcontroller basics	Newnes Publication	2008
3.	Ajay V. Deshmukh	Advanced Microprocessors and Peripherals	TMH Publications	2005

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19ADC04 **PROCESSOR ARCHITECTURE LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

1. To Understand the basic introduction of Assembly level language programming
2. To illustrate the Architecture of 80x86 processor
3. To Apply the memory management techniques
4. To Implement the Multitasking ,Interrupts,Exceptins And I/o operations
5. To Develop the applications using microcontroller

COURSE OUTCOMES

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

19ADC04.CO1 Basic Understand of Assembly level language programming
19ADC04.CO2 Describe the general Architecture of 80x86 processor, Memory and organization
19ADC04.CO3 Describe Memory Management Techniques
19ADC04.CO4 State Multitasking, Interrupts, Exceptions and I/O operations
19ADC04.CO5 Implement applications using microcontroller

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC04.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19ADC04.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC04.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC04.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19ADC04.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

LIST OF PROGRAMS

1. Introduction to Assembly Language programming
2. A sample 8086 assembly program
3. HEX to BCD and BCD TO HEX conversion
4. String operations
5. C programming Using int86,int86x,intdos,int dosX functions.
6. Switch from Real mode to protected mode and back to real mode.
7. Study of 80386 Architecture.
8. 8051 programming; addition of n 8-bit numbers
9. 8051 programming: 16 bit* 8 bit multiplication
10. Timer programming
11. 8051 Stepper Motor Interfacing

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19ADC05 **INTRODUCTION TO DATA SCIENCE** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To Understand the key concepts of Data Science and its Applications
2. To Analyze the results on Data Collection and Data Pre-Processing
3. To Recall the mathematical concepts for descriptive and statistical analysis of the given dataset
4. To Apply Model development and evaluation
5. To Analyze the results on Model Evaluation metrics and validation

COURSE OUTCOMES

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

19ADC05.CO1 Implement Data Science and its Applications
19ADC05.CO2 Apply results on Data Collection and Data Pre-Processing
19ADC05.CO3 Implement the Graph in Statistics.
19ADC05.CO4 Analyze Model development and evaluation
19ADC05.CO5 Analyze Model Evaluation metrics and validation

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC05.CO1	X	X	X	X	-	-	-	-	-	-	X	X	X	X	X
19ADC05.CO2	X	X	X	X	X	X	-	-	-	-	X	X	X	X	X
19ADC05.CO3	X	X	X	X	X	-	-	X		X	X	X	X	X	X
19ADC05.CO4	X	X	X	X	-	X	-	X	-	X	X	X	X	X	X
19ADC05.CO5	X	X	X	X	X	X	-	X	-	-	X	X	X	X	X

UNIT- I INTRODUCTION 9

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applicationsof Data Science in various fields – Data Security Issues

UNIT- II DATA COLLECTION AND DATA PRE-PROCESSING 9

Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – DataReduction – Data Discretization.

UNIT- III EXPLORATORY DATA ANALYTICS 9

Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – PolynomialRegression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making

UNIT- IV MODEL DEVELOPMENT 9

Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – CorrelationStatistics – ANOVA

UNIT- V MODEL EVALUATION 9

Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Over fitting – Under Fitting and Model Selection Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jojo Moolayil	"Smarter Decisions : The Intersection ofIoT and Data Science"	PACKT	2016

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Cathy O'Neil and Rachel Schutt	"Doing Data Science"	O'Reilly	2015
2.	David Dietrich, Barry Heller, Beibei Yang	"Data Science and Big data Analytics"	EMC	2013
3.	Raj, Pethuru	"Handbook of Research on Cloud Infrastructures for Big DataAnalytics"	IGI Global	2017

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19ADC06 **OBJECT ORIENTED PROGRAMMING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

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

COURSE OUTCOMES

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

19ADC06.CO1 Understand Java programs using OOP principles
19ADC06.CO2 Apply Java programs with the concepts inheritance and interfaces
19ADC06.CO3 Construct Java applications using exceptions and I/O streams
19ADC06.CO4 Develop Java applications with threads and generics classes
19ADC06.CO5 Implement Develop 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
19ADC06.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19ADC06.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC06.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC06.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19ADC06.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 Structuresin 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 HOURS 45

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Text Books:

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

Reference Books:

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

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19ADC07 **OPERATING SYSTEM** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

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

COURSE OUTCOMES

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

19ADC07.CO1 Recall the basic architectural components involved in design an operating system.
19ADC07.CO2 Recognize the various scheduling algorithms for different types of operating system.
19ADC07.CO3 Develop resource management techniques and handling Deadlock issues.
19ADC07.CO4 Investigate to change the disk structure and access the files.
19ADC07.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
19ADC07.CO1	-	-	x	-	-	x	-	-	-	-	-	x	-	x	-
19ADC07.CO2	-	x	-	-	x	x	-	-	-	x	x	-	x	x	-
19ADC07.CO3	-	-	x	-	-	x	-	-	x	-	-	x	-	-	x
19ADC07.CO4	x	x	-	x	-	-	x	-	-	x	-	-	x	-	-
19ADC07.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 ALGORTIHMS 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 HOURS 45

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Text Books:

S.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:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Andrew S Tanenbaum	Modern Operating Systems	PHI, Second Edition	2009
2	Damhamdhere	OperatingSystems:A Concept-BasedApproach	TataMc-grawHill Publishing 3rd Edition	2012
3	Charles Crowley	OperatingSystem:A Design-Oriented A pproach	TataMc-grawHill Publishing 1ST edition	2009
4	EviNemeth,Garth Snyder,TrentR. Hein,BenWhaley, DanMackin	UNIXandLinuxSystem AdministrationHandbook	PrenticeHallofIndia,4th Edition	2010
5	HarveyM.Deitel	OperatingSystems	PearsonEducation, 3rdEdition.	2007

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19ADC08 **OPERATING SYSTEM LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

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

Course Outcomes:

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

19ADC08.CO1	Enumerate to develop application programs using system calls in Unix.
19ADC08.CO2	Estimate interprosses communication between two processes.
19ADC08.CO3	Develop and solve synchronization problems.
19ADC08.CO4	Analyze to simulate operating system concepts such as scheduling, deadlock management, file management, and memory management.
19ADC08.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
19ADC08.CO1	-	-	X	-	-	X	-	-	-	-	-	X	-	X	-
19ADC08.CO2	-	X	-	-	x	X	-	-	-	X	x	-	X	x	-
19ADC08.CO3	-	-	X	-	-	X	-	-	X	-	-	X	-	-	X
19ADC08.CO4	X	X	-	X	-	-	X	-	-	X	-	-	X	-	-
19ADC08.CO5	X	-	-	-	-	X	X	-	-	X	-	X	X	-	-

LIST OF PROGRAMS

1. Write C programs to simulate the following CPU scheduling algorithms: Round Robin b) SJF
2. Write C programs to simulate the following CPU scheduling algorithms: FCFS b) Priority
3. Write a C program to copy the contents of one file to another using system calls.
4. Write a C program to simulate Bankers Algorithm for Dead Lock Avoidance
5. Write a C program to simulate Bankers Algorithm for Dead Lock Prevention
6. Write C programs to simulate the following page replacement algorithms: FIFO b) LRU c) LFU
7. Write C programs to simulate the following techniques of memory management :a) Paging b) Segmentation
8. Write a C program to implement the ls | sort command. (Use unnamed Pipe)
9. Write a C program to solve the Dining- Philosopher problem using semaphores.
10. Write C programs to simulate the following File organization techniques: a)Single level directory b) Two level c)Hierarchical
11. Write C programs to simulate the following File allocation methods: 19a)Contiguous b)Linked c)Indexed

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19ADC09 **DESIGN AND ANALYSIS OF ALGORITHMS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To Introduce various Mathematical techniques for representation and manipulation of the data in the real world.
2. To Expose students to a variety of technique for designing and analyzing algorithms
3. To Summarize the choice of Data Structures and algorithms by designing the performance of programs
4. To 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

19ADC09.CO1 Identify algorithm design methodology to solve problems.
19ADC09.CO2 Analyze the algorithm efficiency by means of mathematical Notations
19ADC09.CO3 Empathize the limitation of Computations
19ADC09.CO4 Design algorithms for network flows
19ADC09.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
19ADC09.CO1	x	x	x	x	x	x	x	-	x	-	x	x	x	x	x
19ADC09.CO2	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x
19ADC09.CO3	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x
19ADC09.CO4	x	x	x	x	x	x	x	-	-	x	x	x	x	x	x
19ADC09.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 HOURS 45

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Text Books:

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

Reference Books:

S.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	2014
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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19ADC10 **DATABASE DESIGN AND MANAGEMENT** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To introduce database development life cycle and conceptual modeling
2. To learn SQL for data definition, manipulation and querying a database
3. To learn relational database design using conceptual mapping and normalization
4. To learn transaction concepts and serializability of schedules
5. To learn data model and querying in object-relational and No-SQL databases

COURSE OUTCOMES

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

19ADC10.CO1	Understand to draw the E-R diagram for the given Relation and use the Data model in Database Design
19ADC10.CO2	Apply the Normalization in optimize storage space
19ADC10.CO3	Design the Hashing Techniques and B+ Tree
19ADC10.CO4	Analysis the Concept of Transaction with Concurrency Control and Timestamp in Database
19ADC10.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
19ADC10.CO1	X	X	X	-	-	-	-	-	X	-	X	X	X	X	-
19ADC10.CO2	X	X	X	X	X	X	-	-	-	-	X	X	X	X	X
19ADC10.CO3	X	X	X	X	X	-	-	X		X	X	X	X	-	X
19ADC10.CO4	X	X	X	X	-	-	-	X	-	X	X	X	X	X	X
19ADC10.CO5	X	X	X	X	-	X	-	X	-	-	X	X	X	X	X

UNIT- I CONCEPTUAL DATA MODELING 9

Database environment – Database system development lifecycle – Requirements collection – Database design -- Entity-Relationship model – Enhanced-ER model – UML class diagrams

UNIT- II RELATIONAL MODEL AND SQL 9

Relational model concepts -- Integrity constraints -- SQL Data manipulation – SQL Data definition – Views -- SQL programming.

UNIT- III RELATIONAL DATABASE DESIGN AND NORMALIZATION 9

ER and EER-to-Relational mapping – Update anomalies – Functional dependencies – Inference rules – Minimal cover – Properties of relational decomposition – Normalization (upto BCNF).

UNIT- IV TRANSACTION MANAGEMENT 9

Transaction concepts – properties – Schedules – Serializability – Concurrency Control – Two-phase locking techniques.

UNIT- V OBJECT RELATIONAL AND NO-SQL DATABASES 9

Mapping EER to ODB schema – Object identifier – reference types – rowtypes – UDTs – Subtypesand supertypes– user-defined routines – Collection types – Object Query Language; No-SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: Hbase data model and CRUD operations.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Thomas M. Connolly, Carolyn E.Begg	Database Systems – A Practical Approach to Design, Implementation, and Management	Sixth Edition, Global Edition, Pearson Education	2015
2.	Ramez Elmasri, Shamkant B.Navathe	Fundamental of Database Systems	7th Edition Pearson Education	2014

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Toby Teorey, Sam Lightstone	Database Modeling Anddesign - LogicalDesign	Fifth Edition, Morgan Kaufmann Publishers	2011
2.	Carlos Coronel, Steven Morris	Design, Implementation ,and Management	Ninth Edition, Cengage learning	2012
3.	Abraham Silberschatz, Henry F Korth, S Sudharshan	Database System Concepts	6thEdition,Tata Mc Graw Hill	2011.
4.	Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom	Database Systems:The Complete Book,	2nd edition, Pearson	2015
5.	S Sumathi, S Esakkirajan	Fundamentals of Relational Database Management Systems,(Studies in Computational Intelligence),	Springer-Verlag	2007
6.	Raghu Ramakrishnan	Database Management Systems	4th Edition,Tata Mc Graw Hill	2010

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19ADC11 DATABASE DESIGN AND MANAGEMENT- LABORATORY **L T P C 0 0 2 1**

COURSE OBJECTIVES:

1. To understand the database development life cycle
2. To learn database design using conceptual modeling, Normalization
3. To implement database using Data definition, Querying using SQL manipulation and SQLprogramming
4. To implement database applications using IDE/RAD tools
5. To learn querying Object-relational databases

COURSE OUTCOMES:

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

19ADC11.CO1 Execute query using SQL DML/DDL Commands.

19ADC11.CO2 Implement programs using PL/SQL including stored procedures, cursors, packages etc

19ADC11.CO3 Construct real time database application using current techniques.

19ADC11.CO4 Analyses the DB tool in various real time application.

19ADC11.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
19ADC11.CO1	X	X	X	X	-	-	-	-	-	-	X	X	X	X	X
19ADC11.CO2	X	X	X	X	X	X	-	-	-	-	X	X	X	X	X
19ADC11.CO3	X	X	X	X	X	-	-	X		X	X	X	X	X	X
19ADC11.CO4	X	X	X	X	-	X	-	X	-	X	X	X	X	X	X
19ADC11.CO5	X	X	X	X	X	X	-	X	-	-	X	X	X	X	X

LIST OF PROGRAMS

1. Database Development Life cycle: Problem definition and Requirement analysis Scope and Constraints
2. Database design using Conceptual modeling (ER-EER) – top-down approach Mapping conceptual to relational database and validate using Normalization
3. Implement the database using SQL Data definition with constraints, Views
4. Query the database using SQL Manipulation
5. Querying/Managing the database using SQL Programming
6. Stored Procedures/Functions
7. Constraints and security using Triggers
8. Database design using Normalization – bottom-up approach
9. Develop database applications using IDE/RAD tools (Eg., NetBeans, VisualStudio)
10. Database design using EER-to-ODB mapping / UML class diagrams
11. Object features of SQL-UDTs and sub-types, Tables using UDTs, Inheritance, Method definition

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19ADC12	ARTIFICIAL INTELLIGENCE I	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To Understand the basic concepts of intelligent agents
2. To Develop general-purpose problem solving agents, logical reasoning agents, and agentsthat reason under uncertainty
3. To Employ AI techniques to solve some of today's real world problems
4. To Emphasis the Logical Agents
5. To Elaborate Knowledge Representation and Planning

COURSE OUTCOMES

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

19ADC12.CO1	Explain autonomous agents that make effective decisions in fully informed, partiallyobservable, and adversarialsettings
19ADC12.CO2	Choose appropriate algorithms for solving given AI problems
19ADC12.CO3	Implement a design in terms of Gamming
19ADC12.CO4	Design and implement logical reasoning agents
19ADC12.CO5	Design and implement agents that can reason under uncertainty

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC12.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19ADC12.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC12.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC12.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19ADC12.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT- I INTELLIGENT AGENTS 9

Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents Problem solving agents – search algorithms – uninformed search strategies

UNIT- II PROBLEM SOLVING 9

Heuristic search strategies – heuristic functions Local search and optimization problems – local search in continuous space – search with non- deterministic actions – search in partially observable environments – online search agents and unknown environments

UNIT- III GAME PLAYING AND CSP 9

Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP

UNIT- IV LOGICAL AGENTS 9

Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining -- resolution

UNIT- V KNOWLEDGE REPRESENTATION AND PLANNING 9

Ontological engineering – categories and objects – events – mental objects and modal logic – reasoning systems for categories – reasoning with default information Classical planning – algorithms for classical planning – heuristics for planning – hierarchical planning -non-deterministic domains – time, schedule, and resources – analysis

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Stuart Russel and Peter Norvig	Artificial Intelligence: A Modern Approach	Fourth Edition, Pearson Education	2020

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Dan W. Patterson	Introduction to AI and ES	Pearson Education	2007
2	Kevin Night, Elaine Rich, and Nair B	Artificial Intelligence	McGraw Hill	2008
3	Patrick H. Winston	Artificial Intelligence	Third edition, Pearson Edition	2006
4	Deepak Khemani	(http://nptel.ac.in/)	Tata McGraw Hill Education	2013

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19ADC13 **ARTIFICIAL INTELLIGENCE – I LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

1. To design and implement different techniques to develop simple autonomous agents that makeeffective decisions in fully informed, and partially observable, settings.
2. To apply appropriate algorithms for solving given AI problems.
3. To Design and implement logical reasoning agents.
4. To Design and implement agents that can reason under uncertainty.
5. To understand the Implementation of these reasoning systems using either backward orforward inference mechanisms

COURSE OUTCOMES

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

19ADC13.CO1	Implement simple PEAS descriptions for given AI tasks
19ADC13.CO2	Develop programs to implement simulated annealing and genetic algorithms
19ADC13.CO3	Demonstrate the ability to solve problems using searching and backtracking
19ADC13.CO4	Ability to Implement simple reasoning systems using either backward or forward inference mechanisms
19ADC13.CO5	Will be able to choose and implement a suitable technics for a given AI task

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC13.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19ADC13.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC13.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC13.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19ADC13.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

LIST OF PROGRAMS

1. Develop PEAS descriptions for given AI tasks
2. Implement basic search strategies for selected AI applications
3. Implement A* and memory bounded A* algorithms
4. Implement genetic algorithms for AI tasks
5. Implement simulated annealing algorithms for AI tasks
6. Implement alpha-beta tree search
7. Implement backtracking algorithms for CSP
8. Implement local search algorithms for CSP
9. Implement propositional logic inferences for AI tasks
10. Implement resolution based first order logic inferences for AI tasks
11. Implement classical planning algorithms
12. Mini-Project

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19ADC14 **DATA ANALYTICS** **L T P C**
3 1 0 4

COURSE OBJECTIVES:

1. To study the basic inferential statistics and sampling distribution.
2. To understand the concept of estimation of parameters using fundamental tests and testingof hypotheses.
3. To understand the techniques of analysis of variance.
4. To gain knowledge in predictive analytics techniques.
5. To perform a case study with any available sample data sets

COURSE OUTCOMES

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

19ADC14.CO1 Understand the concept of sampling
19ADC14.CO2 Apply the knowledge to derive hypotheses for given data
19ADC14.CO3 Demonstrate the skills to perform various tests in the given data
19ADC14.CO4 Ability to derive inference using Predictive Analytics
19ADC14.CO5 Perform statistical analytics on a data set

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC14.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19ADC14.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC14.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC14.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19ADC14.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT- I INFERENTIAL STATISTICS I **9+3**

Populations – samples – random sampling – probability and statistics Sampling distribution – creating a sampling distribution – mean of all sample means – standard error of the mean – other sampling distributions Hypothesis testing – z-test – z-test procedure – statement of the problem – null hypothesis – alternate hypotheses – decision rule – calculations – decisions - interpretations

UNIT- II INFERENTIAL STATISTICS II **9+3**

Why hypothesis tests? – strong or weak decisions – one-tailed and two-tailed tests – case studies Influence of sample size – power and sample size Estimation – point estimate – confidence interval – level of confidence – effect of sample size

UNIT- III T-TEST **9+3**

t-test for one sample – sampling distribution of t – t-test procedure – degrees of freedom – estimating the standard error – case studies t-test for two independent samples – statistical hypotheses – sampling distribution – test procedure – p-value – statistical significance – estimating effect size – meta analysis t-test for two related samples

UNIT- IV ANALYSIS OF VARIANCE **9+3**

F-test – ANOVA – estimating effect size – multiple comparisons – case studies Analysis of variance with repeated measures Two-factor experiments – three f-tests – two-factor ANOVA – other types of ANOVA Introduction to chi-square tests

UNIT- V PREDICTIVE ANALYTICS **9+3**

Linear least squares – implementation – goodness of fit – testing a linear model – weighted re-sampling
Regression using Stats Models – multiple regression – nonlinear relationships – logistic regression – estimating parameters – accuracy Time series analysis – moving averages – missing values – serial correlation – autocorrelation Introduction to survival analysis

TOTAL HOURS 45+15

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Robert S. Witte and John S. Witte	Statistics	Eleventh Edition, Wiley Publications	2017
2	Allen B. Downey	Think Stats: Exploratory Data Analysis in Python	Green Tea Press	2014

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	David Spiegelhalter	The Art of Statistics: Learning from Data	Pelican Books	2020
2	Peter Bruce, Andrew Bruce, and Peter Gedek	Practical Statistics for Data Scientists	Second Edition, O'Reilly Publishers	2020
3	Charles R. Severance	Python for Everybody: Exploring Data in Python 3	ShroffPublishers	2017
4	Bradley Efron and Trevor Hastie	Computer Age Statistical Inference	Cambridge University Press	2016
5	Jake VanderPlas	Python Data Science Handbook	O'Reilly	2016

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19ADC15 **DATA ANALYTICS–I LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

1. To study and write simple programs using the basic packages for handling data
2. To do various sampling and T,Z,Anova test in various samples
3. To perform case study and design a system
4. To demonstrate Time Series Analysis in any real time application
5. To Implement Goodness of fit

COURSE OUTCOMES

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

19ADC15.CO1 To become skilled to use various packages in Python
19ADC15.CO2 Demonstrate the understanding of data distribution with various samples
19ADC15.CO3 Ability to Implement T-Test ,ANOVA and Z-Test on sample data sets
19ADC15.CO4 Understanding of Mathematical models in real world problems.
19ADC15.CO5 Conduct time series analysis and draw conclusion

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC15.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19ADC15.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC15.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC15.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19ADC15.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

LIST OF PROGRAMS

1. Random Sampling
2. Z-test case study
3. T-test case studies
4. ANOVA case studies
5. Regression
6. Logistic Regression
7. Time series Analysis

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19ADC16 **COGNITIVE SYSTEMS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To study the basic concepts and approaches in the field of cognitive science
2. To apply the concepts of planning, reasoning and learning models in cognitive applications
3. To understand language and semantic models of cognitive process.
4. To Clarify Problem Solving and Neuroscience
5. To Acquire Network Knowledge towards Cognitive Science

COURSE OUTCOMES

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

19ADC16.CO1 Learn and understand the learning model and apply the same to appropriate real worldapplications
19ADC16.CO2 Apply reasoning methodology to real world applications
19ADC16.CO3 Students will understand and apply declarative and logic models
19ADC16.CO4 Envisage the concept of cognitive learning
19ADC16.CO5 Acquire knowledge in language processing and understanding

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC16.CO1	x	-	-	-	x	-	-	x	-	x	-	-	-	-	x
19ADC16.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC16.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC16.CO4	-	-	x	x	x	-	x	-	-	x	-	-	x	-	-
19ADC16.CO5	x	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT- I INTRODUCTION TO COGNITIVE SCIENCE 9

A Brave New World – Introduction Cognitive Science –Representation: Digital, Analog, Dual-Coding and Propositional – Computation - Interdisciplinary Perspective - Cognitive Approach: Mind as an Information Processor - Modularity of Mind - Theories of Vision and Pattern Recognition

UNIT- II COGNITIVE AND PROBLEM SOLVING 9

Rise of Cognitive Psychology - Mind as an Information Processor - Evaluating the Modular Approach - Theories of Vision and Pattern Recognition - Theories of Attention - Evaluating theModel-Building Approach Types of Memory – Memory Models - Visual Imagery - Problem Solving - Overall Evaluation of the Cognitive Approach

UNIT- III NETWORK AND NEUROSCIENCE APPROACH 9

Principles Underlying Artificial Neural Networks (ANN) - Characteristics of ANN – Conceptions of Neural Networks - Back Propagation and Convergent Dynamics - ANN Typologies - Evaluating the Connectionist Approach - Semantic Networks - Characteristics of Semantic Networks - Evaluation of the network approach Methodology in Neuroscience - Brain Recording Techniques - Brain Anatomy - Visual Object Recognition - Neuroscience of Attention

UNIT- IV LINGUISTIC APPROACH: LANGUAGE AND COGNITIVE SCIENCE 9

Importance of Language – Nature Language - Language Use in Primates - Language Acquisition -Language Deprivation - Cognition and Linguistics: The Role of Grammar - Neuroscience and Linguistics - Artificial Intelligence and Linguistics – Speech Recognition - Evaluation of Natural Language Processing

UNIT- V ARTIFICIAL INTELLIGENCE AND COGNITIVE SCIENCE 9

Definition of AI – History - Practical World of Artificial Intelligence - Approaches to the Design of Intelligent Agents - Machine Representation of Knowledge - Machine Reasoning - Logical Reasoning - Inductive Reasoning - Expert Systems

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Jay Friedenberg and Gordon Silverman	Cognitive Science: An Introduction to the Science of the Mind	Cambridge University Press, New York	2015
2	Stuart J. Russell, Peter Norvig	Artificial Intelligence - A Modern Approach	Third Edition, Pearson Publishers	2015

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Paul Miller	An Introductory Course in Computational Neuroscience	MIT Press	2018
2	Jerome R. Busemeyer, Zheng Wang, James T. Townsend, Ami Eidels(Ed)	The Oxford Handbook of Computational and Mathematical Psychology	Oxford University Press	2015
3	Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein	Cognitive Science: An Introduction	Second Edition, MIT press	2015

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19ADC17 **OPTIZATION TECHNIQUES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To formulate and solve linear programming problems (LPP)
2. To evaluate Integer Programming Problems, Transportation and Assignment Problems.
3. To obtain solution to network problems using CPM and PERT techniques.
4. To optimize the function subject to the constraints.
5. To Identify and solve problems under Markovian queuing models.

COURSE OUTCOMES

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

19ADC17.CO1 Formulate and solve linear programming problems (LPP)
19ADC17.CO2 Evaluate Integer Programming Problems, Transportation and Assignment Problems.
19ADC17.CO3 Obtain solution to network problems using CPM and PERT techniques.
19ADC17.CO4 Able to optimize the function subject to the constraints.
19ADC17.CO5 Identify and solve problems under Markovian queuing models

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC17.CO1	x	-	-	-	x	-	-	x	-	x	-	-	-	-	x
19ADC17.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC17.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC17.CO4	-	-	x	x	x	-	x	-	-	x	-	-	x	-	-
19ADC17.CO5	x	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT- I LINEAR MODELS **9**

Introduction of Operations Research - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Big M method, Two-Phase method

UNIT- II INTEGER PROGRAMMING AND TRANSPORTATION ROBLEMS **9**

Integer programming: Branch and bound method- Transportation and Assignment problems - Travelling salesman problem.

UNIT- III PROJECT SCHEDULING **9**

Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM

UNIT- IV CLASSICAL OPTIMISATION THEORY **9**

Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions.

UNIT- V QUEUING MODELS **9**

Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels.

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Hamdy A Taha	Operations Research: An Introduction	Pearson, 10th Edition	2017

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	ND Vohra	Quantitative Techniques in Management	Tata McGraw Hill, 4th Edition	2011
2	J. K. Sharma	Operations Research Theory and Applications	Macmillan, 5th Edition	2012
3	Hiller F.S, Liberman G.J	Introduction to Operations Research	10th Edition McGraw Hill	2017
4	Jit. S. Chandran, Mahendran P. Kawatra, KiHoKim	Essentials of Linear Programming	Vikas Publishing House Pvt.Ltd. New Delhi	1994
5	Ravindran A., Philip D.T., and Solberg J.J	Operations Research	John Wiley, 2nd Edition	2007

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19ADC18 **DATA EXPLORATION AND VISUALIZATION** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To understand the basics of Data Explorations
2. To understand the basic concepts of Data visualization
3. To study the linear and non-linear ways of Data visualization
4. To explore the data visualization using R language
5. To apply various data visualization techniques for a variety of tasks

COURSE OUTCOMES

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

19ADC18.CO1 Understand the basics of Data Exploration
19ADC18.CO2 Use Univariate and Multivariate Analysis for Data Exploration
19ADC18.CO3 Explain various Data Visualization methods
19ADC18.CO4 Apply the concept of Data Visualization on various datasets
19ADC18.CO5 Apply the data visualization techniques using R language

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC18.CO1	x	-	-	-	x	-	-	x	-	x	-	-	-	-	x
19ADC18.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC18.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC18.CO4	-	-	x	x	x	-	x	-	-	x	-	-	x	-	-
19ADC18.CO5	x	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT- I INTRODUCTION TO DATA EXPLORATION **9**

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardising – Inequality - Smoothing Time Series.

UNIT- II INTRODUCING TWO VARIABLE AND THIRDVARIABLE **9**

Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations - Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data.

UNIT- III BASICS OF DATA VISUALIZATION **9**

The Seven Stages of Visualizing Data - Getting Started with Processing - Mapping - Time Series -Connections and Correlations - Scatterplot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs – Acquiring Data – Parsing Data

UNIT- IV DATA EXPLORATION AND DATA VISUALIZATION IN R **9**

Introduction to R and RStudio - The Basics of Data Exploration - Loading Data into R - Transforming Data - Creating Tidy Data

UNIT- V TECHNIQUES AND APPLICATIONS OF DATAEXPLORATION AND VISUALIZATION IN R **9**

Basic Data Exploration Techniques - Basic Data Visualization Techniques - Visualizing Geographic Data with ggmap - R Markdown - Case Study – Wildfire Activity in the Western United States - Case Study – Single Family Residential Home and Rental Values

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Catherine Marsh, Jane Elliott	Exploring Data: An Introduction to Data Analysis for SocialScientists	Wiley Publications, 2nd Edition	2008

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Eric Pimpler	Data Visualization and Exploration with R	Geo Spatial Training service	2017
2	Xiang Zhou, Sean, Yong Rui, Huang, Thomas S	., Exploration of Visual Data	Springer Publications	2003
3	Claus.O.Wlike	Fundamentals of Data Visualization, A primer on making informative and compelling Figures	O'Reily Publications	2019

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19ADC19 **MACHINE LEARNING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To understand the basics of Machine Learning (ML)
2. To understand the methods of Machine Learning
3. To know about the implementation aspects of machine learning
4. To understand the concepts of Data Analytics and Machine Learning
5. To understand and implement usecases of ML

COURSE OUTCOMES

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

19ADC19.CO1 Understand the basics of ML
19ADC19.CO2 Explain various ZMachine Learning methods
19ADC19.CO3 Demonstrate various ML techniques using standard packages.
19ADC19.CO4 Explore knowledge on Machine learning and Data Analytics
19ADC19.CO5 Apply ML to various real time examples

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC19.CO1	x	x	x	x	x	x	x	-	x	-	x	x	x	x	x
19ADC19.CO2	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x
19ADC19.CO3	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x
19ADC19.CO4	x	x	x	x	x	x	x	-	-	x	x	x	x	x	x
19ADC19.CO5	x	x	x	x	x	x	x	-	-	-	x	x	x	x	x

UNIT- I MACHINE LEARNING BASICS **9**

Introduction to Machine Learning (ML) - Essential concepts of ML – Types of learning – Machine learning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends in Machine learning – Data Understanding Representation and visualization.

UNIT- II MACHINE LEARNING METHODS **9**

Linear methods – Regression -Classification –Perceptron and Neural networks – Decision trees –Support vector machines – Probabilistic models —Unsupervised learning – Featurization

UNIT- III MACHINE LEARNING IN PRACTICE **9**

Ranking – Recommendation System - Designing and Tuning model pipelines- Performance measurement – Azure Machine Learning – Open-source Machine Learning libraries – Amazon's Machine Learning Tool Kit: Sagemaker

UNIT- IV MACHINE LEARNING AND DATA ANALYTICS **9**

Machine Learning for Predictive Data Analytics – Data to Insights to Decisions – Data Exploration –Information based Learning – Similarity based learning – Probability based learning – Error based learning – Evaluation – The art of Machine learning to Predictive Data Analytics.

UNIT- V APPLICATIONS OF MACHINE LEARNING **9**

Image Recognition – Speech Recognition – Email spam and Malware Filtering – Online fraud detection – Medical Diagnosis.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Ameet V Joshi	Machine Learning and Artificial Intelligence	Springer Publications	2020
2	John D. Kelleher, Brain Mac Namee, Aoife D` Arcy	Fundamentals of Machine learning forPredictive Data Analytics, Algorithms, Worked Examples and case studies	MIT press	2015

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Christopher M. Bishop	Pattern Recognition and Machine Learning	Springer Publications	2011
2	Stuart Jonathan Russell, Peter Norvig, John Canny	Artificial Intelligence: A Modern Approach	Prentice Hall	2020
3	John Paul Muller, Luca Massaron	Machine Learning Dummies	Wiley Publications	2021

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19ADC20 **MACHINE LEARNING LAB** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

1. To get practical knowledge on implementing machine learning algorithms in real time problem for getting solutions
2. To implement supervised learning and their applications
3. To understand unsupervised learning like clustering and EM algorithms
4. To understand the theoretical and practical aspects of probabilistic graphical models.

COURSE OUTCOMES

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

19ADC20.CO1 Understand the implementation procedures for the machine learning algorithms.
19ADC20.CO2 Design Java/Python programs for various Learning algorithms.
19ADC20.CO3 Apply appropriate Machine Learning algorithms to data sets
19ADC20.CO4 Identify and apply Machine Learning algorithms to solve real world problems.
19ADC20.CO5 Understand the implementation procedures for the machine learning algorithms.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC20.CO1	x	x	x	x	x	x	x	-	x	-	x	x	x	x	x
19ADC20.CO2	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x
19ADC20.CO3	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x
19ADC20.CO4	x	x	x	x	x	x	x	-	-	x	x	x	x	x	x
19ADC20.CO5	x	x	x	x	x	x	x	-	-	-	x	x	x	x	x

LIST OF PROGRAMS

1. Implement the concept of decision trees with suitable data set from real world problem andclassify the data set to produce new sample.
2. Detecting Spam mails using Support vector machine
3. Implement facial recognition application with artificial neural network
4. Study and implement amazon toolkit: Sagemaker
5. Implement character recognition using Multilayer Perceptron
6. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
7. Implement sentiment analysis using random forest optimization algorithm
8. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. Youcan use Java/Python ML library classes/API.
9. Choose best machine learning algorithm to implement online fraud detection
10. Mini-project: students work in team on any socially relevant problem that needs a machinelearning based solution, and evaluate the model performance.

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19ADC21 **BUSINESS ANALYTICS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To understand the Analytics Life Cycle.
2. To comprehend the process of acquiring Business Intelligence
3. To understand various types of analytics for Business Forecasting
4. To model the supply chain management for Analytics.
5. To apply analytics for different functions of a business

COURSE OUTCOMES

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

19ADC21.CO1 Explain the real world business problems and model with analytical solutions.
19ADC21.CO2 Identify the business processes for extracting Business Intelligence
19ADC21.CO3 Apply predictive analytics for business fore-casting
19ADC21.CO4 Apply analytics for supply chain and logistics management
19ADC21.CO5 Use analytics for marketing and sales.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC21.CO1	x	x	-	-	-	-	-	-	-	-	-	-	x	x	-
19ADC21.CO2	x	-	x	-	x	-	-	-	-	-	-	x	-	-	-
19ADC21.CO3	x	-	-	x	x	-	-	-	-	-	-	-	-	x	-
19ADC21.CO4	-	x	x	x	x	-	-	-	x	-	-	x	-	x	x
19ADC21.CO5	-	x	x	x	x	-	-	-	x	-	-	x	x	-	x

UNIT- I INTRODUCTION TO BUSINESS ANALYTICS 9

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration

UNIT- II BUSINESS INTELLIGENCE 9

Data Warehouses and Data Mart - Knowledge Management – Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence – OLAP –, Analytic functions

UNIT- III BUSINESS FORECASTING 9

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modeling – Machine Learning for Predictive analytics.

UNIT- IV HR & SUPPLY CHAIN ANALYTICS 9

Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain

UNIT- V MARKETING & SALES ANALYTICS 9

Marketing Strategy, Marketing Mix, Customer Behavior – selling Process – Sales Planning – Analytics applications in Marketing and Sales

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Philip Kotler and Kevin Keller	Marketing Management	15th edition, PHI	2016

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	R. Evans James	Business Analytics	-	2017
2	R N Prasad, Seema Acharya	Fundamentals of Business Analytics	-	2016
3	VSP RAO	Human Resource Management	3rd Edition, Excel Books	2010
4	Mahadevan B	"Operations Management -Theory and Practice"	3rd Edition, Pearson Education	2018

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19ADC22 INTERNET PROGRAMMING AND WEB TECHNOLOGIES

L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To comprehend and analyze the basic concepts of web programming and internet Protocols.
2. To describe how the client-server model of Internet programming works.
3. To demonstrates the uses of scripting languages and their limitations.
4. To study and developing the web applications.
5. To impart the skill in the server side scripting.

COURSE OUTCOMES

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

19ADC22.CO1 Know the different web protocols and web architecture.
19ADC22.CO2 Apply HTML and CSS effectively to create dynamic websites.
19ADC22.CO3 Create event responsive webpages using AJAX and JQuery.
19ADC22.CO4 Implement server-side programming like session, cookies, file handling and database connectivity using PHP.
19ADC22.CO5 Develop web applications using advanced technologies such as Node JS

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC22.CO1	x	x	-	x	x	-	-	-	-	-	-	x	-	x	-
19ADC22.CO2	x	-	x	x	x	-	x	x	-	-	x	-	-	-	-
19ADC22.CO3	x	-	x	x	x	-	-	-	x	-	x	-	-	x	-
19ADC22.CO4	x	-	x	x	x	-	x	-	-	-	x	-	-	-	x
19ADC22.CO5	x	x	-	x	x	x	-	-	x	-	x	-	x	-	-

UNIT- I INTRODUCTION TO INTERNET 9

Internet Overview- Networks – WWW –Web Protocols — Web Organization and Addressing – Internet Service Providers, DNS Servers, Connection Types, Internet Addresses - Web Browsers and Web Servers -Security and Vulnerability-Web System Architecture – URL - Domain Name – Web Content Authoring - Webserver Administration – Search Engines

UNIT- II CLIENT SIDE SCRIPTING 9

HTML5 – Text tags; Graphics, Form elements, HTML 5 Input types, HTML 5 Input types, semantic tags, CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Cascading and inheritance of style properties - JavaScript -Variables and Data Types - Statements – Operators- Literals- Functions- Objects- Arrays- Built-in Objects, DOM – BOM - Regular Expression Exceptions, Event handling, Validation- JQuery

UNIT- III DEVELOPING INTERACTIVE WEB APPLICATIONS 9

AJAX –AJAX calls - XML http – request – response – AJAX with PHP - Data Formats - AJAX with Database – Processing Server Response - AJAX Security

UNIT- IV SERVER SIDE SCRIPTING 9

Introduction to Node.js- NPM - Events, Timers, and Callbacks in Node.js – file upload – email – Express framework – request –response –routing - templates- view engines. Introduction to Mongo DB- creating DB, collection – CRUD operations - Accessing MongoDB from Node.js. – Accessing online Mongo DB from Node JS.

UNIT- V REACT WEB FRAMEWORK 9

Introduction – Environment setup – JSX – React DOM – React Elements - Components – react state – Props– Hooks – Component life cycle- React Router – event handlers - React lists – react forms – react HTML render – react refs – react CSS –Array immutability – Lazy loading – Storing to local storage – Create a sample React App

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Paul J. Deitel, Harvey Deitel	Internet and World Wide Web How To Program	6th Edition, Pearson	2020
2	Vasan Subramanian	Pro MERN Stack - Full stack web app development	2nd Edition	2019

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Jessica Minnick	Responsive Web Design with HTML 5 & CSS	Cengage Learning	2020
2	Frank Zammetti	Modern Full-Stack Development: TypeScript, React, Node.js	1st Edition, Apress	2020

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19ADC23 INTERNET PROGRAMMING AND WEB TECHNOLOGIES L T P C 0 0 2 1

COURSE OBJECTIVES:

1. To get practical knowledge on implementing HTML form.
2. To understand file handling concepts
3. To understand AJAX application
4. To understand the theoretical and practical aspects Node JS.

COURSE OUTCOMES

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

19ADC23.CO1 Understand the implementation procedures for JavaScript
19ADC23.CO2 Design Java/Python programs for various PHP file handling and forms.
19ADC23.CO3 Apply appropriate database and server with AJAX.
19ADC23.CO4 Identify and apply Mongo DB to solve real world problems.
19ADC23.CO5 Understand the implementation procedures for Mongo DB

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC23.CO1	x	x	-	x	x	-	-	-	-	x	-	x	-	x	-
19ADC23.CO2	x	-	x	x	x	-	x	x	-	-	x	-	-	-	-
19ADC23.CO3	x	-	x	x	x	-	-	-	x	-	x	-	-	x	-
19ADC23.CO4	x	-	x	x	x	-	x	-	-	-	x	-	-	-	x
19ADC23.CO5	x	x	-	x	x	x	-	-	x	-	-	-	x	-	-

LIST OF PROGRAMS

1. HTML form validation with JavaScript
2. PHP : Forms and File handling
3. PHP : Session Management and Cookies, Databases
4. Custom Services in Applications using AJAX
5. Database and Server Response with AJAX
6. React : Content projection, Manipulating Data With Pipes
7. Node JS and Mongo DB

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19ADC24 **ARTIFICIAL INTELLIGENCE II** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To know the underlying structure behind intelligence mathematically.
2. To know the logical implications in probabilistic Reasoning.
3. To know the automated learning techniques.
4. To explore the techniques in Reinforcement Learning.
5. To explore artificial intelligence techniques for Robotics.

COURSE OUTCOMES

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

19ADC24.CO1 Explain the probabilistic reasoning using Bayesian inference
19ADC24.CO2 Apply appropriate Probabilistic reasoning techniques for solving uncertainty problems
19ADC24.CO3 Explain use of game theory for decision making.
19ADC24.CO4 Explain and apply probabilistic models for various use cases
19ADC24.CO5 Apply AI techniques for robotics

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC24.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19ADC24.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC24.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC24.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19ADC24.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

UNIT- I PROBABILISTIC REASONING I **9**

Acting under uncertainty – Bayesian inference – naïve bayes models -Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks

UNIT- II PROBABILISTIC REASONING II **9**

Probabilistic reasoning over time – time and uncertainty – inference in temporal models – HiddenMarkov Models – Kalman filters – Dynamic Bayesian networks-Probabilistic programming

UNIT- III DECISIONS UNDER UNCERTAINTY **9**

Basis of utility theory – utility functions – Multiattribute utility functions – decision networks – value of information – unknown preferences- Sequential decision problems – MDPs – Bandit problems – partially observable MDPs Multiagent environments – non-cooperative game theory – cooperative game theory – making collective decisions

UNIT- IV LEARNING PROBABILISTIC MODELS **9**

Statistical learning theory – maximum-likelihood parameter learning – naïve bayes models – generative and descriptive models – continuous models – Bayesisn parameter learning – Bayesian linear regression – learning Bayesian net structures – density estimation-EM Algorithm – unsupervised clustering – Gaussian mixture models – learning Bayes netparameters – learning HMM – learning Bayes net structures with hidden variables

UNIT- V REINFORCEMENT LEARNING AND ROBOTICS **9**

Learning from rewards – passive reinforcement learning – active reinforcement learning – generalization in reinforcement learning – policy search – inverse reinforcement learning – applications-Robots – robotic perception – planning movements – reinforcement learning in robotics – robotic frameworks -- applications of robotics- Philosophy, ethics, and safety of AI – the future of AI

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Stuart Russel and Peter Norvig	"Artificial Intelligence: A Modern Approach"	FourthEdition, Pearson Education	2020

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Dan W. Patterson	"Introduction to AI and ES"	Pearson Education	2007
2	Kevin Night, Elaine Rich, and Nair B	"Artificial Intelligence"	McGraw Hill	2008
3	Patrick H. Winston	"Artificial Intelligence"	Third edition, Pearson Edition	2006
4	Deepak Khemani	"Artificial Intelligence"	Tata McGraw Hill Education	2013

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19ADC25 **ARTIFICIAL INTELLIGENCE - II LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

1. To impart knowledge about Artificial Intelligence..
2. To understand the main abstractions and reasoning for intelligent systems.
3. To understand the use of Artificial Intelligence in various applications

COURSE OUTCOMES

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

19ADC25.CO1 Solve basic AI based problems.
19ADC25.CO2 Implement the concept of Bayesian Network.
19ADC25.CO3 Apply AI techniques to real-world problems to develop intelligent systems
19ADC25.CO4 Implement HMM for real-world application.
19ADC25.CO5 Use Reinforcement Learning to implement various intelligent systems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC25.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
19ADC25.CO2	x	-	-	x	x	x	-	-	-	-	x	-	-	x	-
19ADC25.CO3	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
19ADC25.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
19ADC25.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

LIST OF PROGRAMS

1. To implement Bayesian Belief networks
2. Approximate inferences in Bayesian network
3. To implement decision problems for various real-world applications
4. To learn various Bayesian parameters
5. Implementation of Hidden Markov Models
6. Implement EM algorithm for HMM
7. Implement the Reinforcement learning for various reward based applications
8. Mini-Project

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19ADC26 **DATA AND INFORMATION SECURITY** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To understand the basics of Number Theory and Security
2. To understand and analyze the principles of different encryption techniques
3. To understand the security threats and attacks
4. To understand and evaluate the need for the different security aspects in real time applications
5. To learn the different applications of information security

COURSE OUTCOMES

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

19ADC26.CO1	Understand the fundamentals of security and the significance of number theory in computer security
19ADC26.CO2	Learn the public key cryptographic standards and authentication scheme
19ADC26.CO3	Able to apply the security frameworks for real time applications
19ADC26.CO4	Understand the security threats and attacks in IoT, Cloud.
19ADC26.CO5	Able to develop appropriate security algorithms understanding the possible threats

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC26.CO1	x	-	-	x	x	-	x	-	x	-	-	-	x	-	-
19ADC26.CO2	x	-	-	-	-	x	-	x	x	x	-	-	x		-
19ADC26.CO3	x	x	x	-	-	x	-	x	x	x	-	-	-	x	-
19ADC26.CO4	x	x	x	x	x	-	-	-	x	x	x	x	-	x	x
19ADC26.CO5	x	x	x	x	x	-	x	-	x	x	x	x	-	x	x

UNIT- I FUNDAMENTALS OF SECURITY 9

Fundamental Security Design Principles – Attack Surfaces and Attack Trees. Computer Security Strategy– Number Theory: Prime Numbers and Factorization, Modular Arithmetic, GCD and Euclidean Algorithm, Chinese Remainder Theorem, Multiplication Modulo m and the Totient Function, Problems, Fermat and Euler Theorem. Primitive Roots and the Structure of F*p, Number in other Bases, Fast Computation of Powers in Z/mZ, Multiplicative Functions, Group Theory, Fields and Problems

UNIT- II ENCRYPTION TECHNIQUES AND KEY MANAGEMENT 9

Symmetric Encryption Principles – Data Encryption Standard – Advanced Encryption Standard –Stream Ciphers and RC4 - Cipher Block Modes Operation – Digital Signatures - Key Distributions - Public Key Cryptosystem: RSA, Elliptic Curve Cryptography - Key Exchange Algorithms: Diffie Hellmen and ELGamal Key Exchange

UNIT- III AUTHENTICATION, INTEGRITY AND ACCESS CONTROL 9

Authentication: Security Hash Function – HMAC – Electronic User Authentication Principles, Password Based Authentication, Token Based and Remote Authentication; Internet Authentication Applications: Kerberos X.509 – Public Key Infrastructure; Access Control: Access Control Principles - Subjects, Objects, and Access Rights - Discretionary Access Control

UNIT- IV SECURITY 9

System Security: Firewall, Viruses, Worms, Ransomeware, Keylogger, Greyware, IDS, DDoS Network Security: SSL – TLs – HTTPS –IP Security; OS Security: Introduction to Operating System Security - System Security Planning - Operating Systems Hardening - Application Security - Linux/Unix Security - Windows Security - Virtualization Security; Wireless Security: Risks and Threats of Wireless- Wireless LAN Security- Wireless Security Policy-Wireless Security Architectures-Wireless security Tools

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UNIT- V SECURITY APPLICATIONS 9

IOT security: Introduction- Architectures- Security challenges- Security requirements- Trust, Dataconfidentiality, and privacy in IOT- Security in future IOT systems; Cloud Security: Cloud Security Architecture- Security Management in the Cloud- Availability Management- SaaS Availability Management- PaaS Availability Management- IaaS Availability Management

TOTAL HOURS 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	William Stallings	"Cryptography and Network Security Principles and Practice"	Pearson Education International, Fifth Edition	2011
2	William Stallings and Lawrie Brown	"Computer Security Principles and Practice"	Pearson Education International, Third Edition	2015

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Tim Mather, Subra Kumaraswamy and Shahed Latif	Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance	Oreilly	2009
2	Mikhail Gloukhovtsev	IoT Security: Challenges, Solutions & Future Prospects	Knowledge Sharing Article, Dell Inc	2018
3	Pradip KumarDas, Hrudaya Kumar Tripathy, Shafiz Affendi Mohd yusuf	Privacy and Security Issues in Big Data, An Analytical View on Business Intelligence	Springer	2021

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19ADC27	DEEP LEARNING	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To understand the basics of deep neural networks
2. To understand CNN of architectures of deep neural networks
3. To understand the concepts of Artificial Neural Networks
4. To learn the basics of Data science in Deep learning
5. To learn about applications of deep learning in AI and Data Science

COURSE OUTCOMES

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

19ADC27.CO1 Explain the basics in deep neural networks
19ADC27.CO2 Apply Convolution Neural Network for image processing
19ADC27.CO3 Explain the basics of Artificial Intelligence using deep learning
19ADC27.CO4 Apply deep learning algorithms for data science
19ADC27.CO5 Apply deep learning algorithms for variety applications

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC27.CO1	x	-	-	x	x	-	x	-	x	-	-	-	x	-	-
19ADC27.CO2	x	-	-	-	-	x	-	x	x	x	-	-	x		-
19ADC27.CO3	x	x	x	-	-	x	-	x	x	x	-	-	-	x	-
19ADC27.CO4	x	x	x	x	x	-	-	-	x	x	x	x	-	x	x
19ADC27.CO5	x	x	x	x	x	-	x	-	x	x	x	x	-	x	x

UNIT- I DEEP NETWORKS BASICS 9

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient- based Optimization – Machine Learning Basics: Capacity -- Overfitting and underfitting -- Hyperparameters and validation sets -- Estimators -- Bias and variance-- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deepfeedforward networks; Regularization -- Optimization.

UNIT- II CONVOLUTIONAL NEURAL NETWORKS 9

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning:Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers -- Gradient Computation.

UNIT- III DEEP LEARNING ALGORITHMS FOR AI 9

Artificail Neural Netowrks – Linear Associative Networks – Perceptrons -The Backpropagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Autoencoders - Deep Backprop Networks- Autoencoders

UNIT- IV DATA SCIENCE AND DEEP LEARNING 9

Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks

UNIT- V APPLICATIONS OF DEEP LEARNING 9

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion - NLP tasks - dimensionality estimation - time series forecasting -building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Ian Goodfellow, Yoshua Bengio, Aaron Courville	Deep Learning	MIT Press	2016

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Stone, James	Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning	Sebtel Press, United States	2019
2.	Vance, William	Data Science: A Comprehensive Beginners Guide to Learn the Realms ofData Science	Joiningthedotstv Limited	2020
3.	Wani, M.A., Raj. B., Luo, F.. Dou, D. (Eds.)	Deep Learning Applications	Volume 3,Springer Publications	2022
4.	Charu C. Aggarwal	Neural Networks and Deep Learning: A Textbook	Springer International Punlishing	2018

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19ADC28 **DEEP LEARNING LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

1. To learn deep neural networks and apply for simple problems
2. To Learn and apply Convolution Neural Network for image processing
3. To Learn and apply Recurrent Neural Network and its variants for text analysis
4. To augment data using generative models
5. To explore real world applications with deep neural networks

COURSE OUTCOMES

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

19ADC28.CO1 Apply deep neural network for simple problems
19ADC28.CO2 Apply Convolution Neural Network for image processing
19ADC28.CO3 Apply Recurrent Neural Network and its variants for text analysis
19ADC28.CO4 Apply generative models for data augmentation
19ADC28.CO5 Develop a real world application using suitable deep neural networks

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC28.CO1	x	-	-	x	x	-	x	-	-	-	-	-	x	-	-
19ADC28.CO2	x	-	-	-	-	x	-	x	x	x	-	-	x		-
19ADC28.CO3	x	x	-	-	-	x	-	x	x	x	-	-	-	x	-
19ADC28.CO4	x	-	x	x	-	-	-	-	x	x	x	x	-	x	x
19ADC28.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	x	x

LIST OF PROGRAMS

1. Solving XOR problem using Multilayer perceptron
2. Implement character and Digit Recognition using ANN.
3. Implement the analysis of X-ray image using autoencoders
4. Implement Speech Recognition using NLP
5. Develop a code to design object detection and classification for traffic analysis using CNN
6. Implement online fraud detection of share market data using any one of the data analytics tools.
7. Implement image augmentation using deep RBM.
8. Implement Sentiment Analysis using LSTM.
9. Mini Project: Number plate recognition of traffic video analysis.

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19ADC29 **AI AND ROBOTICS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To study the Robot Locomotion and types of robots.
2. To explore the kinematic models and constraints
3. To Learn sensors of robots and image processing for robotics.
4. To understand the methods for mobile robot Localization
5. To study the Path planning and Navigation of Robots.

COURSE OUTCOMES

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

19ADC29.CO1 Explain the types of Robots
19ADC29.CO2 Narrate the kinematics of Robots
19ADC29.CO3 Implement image processing algorithms
19ADC29.CO4 Devise Localization algorithms
19ADC29.CO5 Devise Path planning methods for navigation

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC29.CO1	x	-	-	x	x	-	x	-	-	-	-	-	x	-	-
19ADC29.CO2	x	-	-	-	-	x	-	x	x	x	-	-	x		-
19ADC29.CO3	x	x	-	-	-	x	-	x	x	x	-	-	-	x	-
19ADC29.CO4	x	-	x	x	-	-	-	-	x	x	x	x	-	x	x
19ADC29.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	x	x

UNIT- I ROBOT LOCOMOTION 9

Introduction to AI and Robotics – robot locomotion – legged mobile robots – wheeled mobile robots – aerial mobile robots.

UNIT- II MOBILE ROBOT KINEMATICS 9

Kinematic models and constraints – mobile robot maneuverability – mobile robot workspace – advanced kinematics – motion control.

UNIT- III ROBOT PERCEPTION 9

Sensors for mobile robots – computer vision for robots – image processing for robotics – place recognition – range data.

UNIT- IV MOBILE ROBOT LOCALIZATION 9

Introduction to localization – noise and aliasing – localization-based navigation – belief representation – map representation – probabilistic map-based localization – autonomous mapbuilding.

UNIT- V ROBOT PLANNING AND NAVIGATION 9

Planning and navigation – planning and reacting – path planning – obstacle avoidance – navigation architectures.

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	R. Siegwart, I. R. Nourbaksh, and D. Scarramuzza	Introduction to Autonomous Mobile Robots	Second Edition, MIT Press	2011

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Stuart Russel and Peter Norvig	Artificial Intelligence: A Modern Approach	Fourth Edition, Pearson Education	2020

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19ADC30	COMPUTER VISION	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To review image processing techniques for computer vision.
2. To understand various features and recognition techniques
3. To learn about histogram and binary vision
4. Apply three-dimensional image analysis techniques
5. Study real world applications of computer vision algorithms

COURSE OUTCOMES

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

19ADC30.CO1 Explain low level processing of image and transformation techniques applied to images.
19ADC30.CO2 Explain the feature extraction, segmentation and object recognition methods.
19ADC30.CO3 Apply Histogram transform for detection of geometric shapes like line, ellipse and objects.
19ADC30.CO4 Illustrate 3D vision process and motion estimation techniques.
19ADC30.CO5 Apply vision techniques to real time applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADC30.CO1	x	x	-	x	x	-	x	-	-	-	-	-	-	x	-
19ADC30.CO2	x	-	x	-	-	x	-	x	x	x	-	-	x		-
19ADC30.CO3	x	x	-	x	x	x	-	x	x	x	-	-	-	x	-
19ADC30.CO4	x	-	x	-	-	-	-	-	x	x	x	x	-	x	x
19ADC30.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I INTRODUCTION 9

Image Processing, Computer Vision ,What is Computer Vision - Low-level, Mid-level, High-level ; Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

UNIT- II FEATURE EXTRACTION AND FEATURE SEGMENTATION 9

Feature Extraction -Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT. Image Segmentation -Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation.

UNIT- III IMAGES, HISTOGRAMS, BINARY VISION 9

Simple pinhole camera model – Sampling – Quantisation – Colour images – Noise – Smoothing – 1D and 3D histograms - Histogram/Image Equalisation - Histogram Comparison - Back-projection - k-means Clustering – Thresholding - Threshold Detection Methods - Variations on Thresholding - Mathematical Morphology – Connectivity.

UNIT- IV 3D VISION AND MOTION 9

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion–spline-based motion- optical flow – layered motion.

UNIT- V APPLICATIONS 9

Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing , Virtual Reality and Augmented Reality.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	D. A. Forsyth, J. Ponce	Computer Vision: A Modern Approach	Pearson Education	2003
2.	Richard Szeliski	Computer Vision: Algorithms and Applications	Springer Verlag London Limited	2011

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B. K. P. Horn	Robot Vision	McGraw-Hill	-
2.	Simon J. D. Prince	Computer Vision: Models, Learning, and Inference	Cambridge University Press	2012
3.	Mark Nixon and Alberto S. Aquado	Feature Extraction & Image Processing for Computer Vision	Third Edition, Academic Press	2012
4.	E. R. Davies	Computer & Machine Vision	Fourth Edition, Academic Press	2012
5.	Reinhard Klette	Concise Computer Vision: An Introduction into Theory and Algorithms		2014

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19ADE01 **SOFTWARE DEVELOPMENT PROCESSES** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To acquire knowledge on software process management
2. To acquire managerial skills for software project development.
3. To understand software economics
4. To acquire knowledge about real time software development scenarios.
5. To understand real time software development processes

COURSE OUTCOMES

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

19ADE01.CO1	Understand the software process phases in the cycle of software development.
19ADE01.CO2	Gain knowledge of software economics, project organization, projectcontrol and process instrumentation
19ADE01.CO3	Analyze the major and minor milestones, artifacts and metrics from management and technical perspective.
19ADE01.CO4	Design and develop software product using conventional and modern principles of software project management
19ADE01.CO5	Analyze the real time software development processes.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE01.CO1	x	-	x	-	x	-	x	-	-	x	-	x	-	x	-
19ADE01.CO2	x	-	x	-	-	x	-	x	x	x	-	-	x	-	-
19ADE01.CO3	x	x	-	x	x	x	-	x	x	x	-	-	-	x	-
19ADE01.CO4	x	-	x	-	-	-	-	-	x	x	x	x	-	x	x
19ADE01.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I **SOFTWARE PROCESS** **9**

Software Process Maturity Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process. Process Reference Models Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

UNIT- II **SOFTWARE ECONOMICS AND LIFECYCLE** **9**

Software Project Management Renaissance Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

UNIT- III **SOFTWARE PROCESSES PLANNING** **9**

Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments. Process Planning Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT- IV **PROJECT MANAGEMENT AND METRICS** **9**

Project Organizations Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

UNIT- V **UNIT TITLE** **9**

CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Watts S. Humphrey	Managing the Software Process	Pearson Education	-
2.	Walker Royce	Software Project Management	Pearson Education	-

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Watts S. Humphrey, James R. Persse, O'Reilly	An Introduction to the Team Software Process	O'Reilly	2006
2.	Bob Hughes & Mike Cotterell	Software Project Management	fourth edition, TMH	2006
3.	Andrew Stellman & Jennifer Greene	Applied Software Project Management	O'Reilly	2007
4.	Jennifer Greene & Andrew Stellman	Head First PMP	O'Reilly	2007
5.	Richard H. Thayer & Edward Yourdon	Software Engineering Project Management	2 nd edition, Wiley India	2004
6.	Jim Highsmith	Agile Project Management	Pearson education	2004

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19ADE02 MICROPROCESSORS AND MICROCONTROLLERS **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To understand the Architecture of 8086 microprocessor.
2. To learn the design aspects of I/O and Memory Interfacing circuits.
3. To interface microprocessors with supporting chips.
4. To study the Architecture of 8051 microcontroller.
5. To design a microcontroller based system

COURSE OUTCOMES

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

19ADE02.CO1 Understand and execute programs based on 8086 microprocessor.
19ADE02.CO2 Design Memory Interfacing circuits.
19ADE02.CO3 Design and interface I/O circuits.
19ADE02.CO4 Design microcontroller based system
19ADE02.CO5 Design and implement 8051 microcontroller based systems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE02.CO1	x	-	x	-	x	-	x	-	-	x	-	x	-	x	-
19ADE02.CO2	x	-	x	-	-	x	-	x	x	x	-	-	x	-	-
19ADE02.CO3	x	x	-	x	x	x	-	x	x	x	-	-	-	x	-
19ADE02.CO4	x	-	x	-	-	-	-	-	x	x	x	x	-	x	x
19ADE02.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I THE 8086 MICROPROCESSOR **9**

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT- II 8086 SYSTEM BUS STRUCTURE **9**

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT- III I/O INTERFACING **9**

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT- IV MICROCONTROLLER **9**

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits -Instruction set - Addressing modes - Assembly language programming.

UNIT- V INTERFACING MICROCONTROLLER **9**

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARMprocessors

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Yu-Cheng Liu, Glenn A.Gibson	Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design	Second Edition, Prentice Hall of India	2007
2.	Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay	The 8051 Microcontroller and Embedded Systems: Using Assembly and C	Second Edition, Pearson education	2011

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Doughlas V.Hall	Microprocessors and Hardware	TMH	2012
2.	A.K.Ray,K.M.Bhurchandi	Advanced Microprocessors and Peripherals	3rd edition, Tata McGrawHill	2012

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19ADE03 **ENGINEERING PREDICTIVE ANALYTICS** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To explain terminology, technology and applications of predictive analysis
2. To apply data preparation techniques and generate appropriate association rules.
3. To discuss various descriptive models, their merits, demerits and application.
4. To describe various predictive modelling methods.
5. To introduce the text mining tools, technologies and case study which is used in day-to- day analytics cycle

COURSE OUTCOMES

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

19ADE03.CO1 Explain terminology, technology and applications of predictive analysis
19ADE03.CO2 Explain terminology, technology and applications of predictive analysis
19ADE03.CO3 Discuss various descriptive models, their merits, demerits and application.
19ADE03.CO4 Describe principles of predictive analytics and apply them to achieve real, pragmatic solutions.
19ADE03.CO5 Illustrate the features and applications of text mining.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE03.CO1	x	-	x	-	x	-	x	-	-	x	-	x	-	x	-
19ADE03.CO2	x	-	x	-	-	x	-	x	x	x	-	-	x	-	-
19ADE03.CO3	x	x	-	x	x	x	-	x	x	x	-	-	-	x	-
19ADE03.CO4	x	-	x	-	-	-	-	-	x	x	x	x	-	x	x
19ADE03.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I INTRODUCTION TO PREDICTIVE ANALYTICS 9

Overview of Predictive Analytics- Setting Up the Problem - Data Understanding- Single Variable- Data Visualization in One Dimension- Data Visualization, Two or Higher Dimensions- The Value of Statistical Significance- Pulling It All Together into a Data Audit.

UNIT- II DATA PREPARATION AND ASSOCIATION RULES 9

Data Preparation- Variable Cleaning- Feature Creation- Item sets and Association Rules-Terminology- Parameter Settings- How the Data Is Organized- Measures of Interesting Rules- Deploying Association Rules- Problems with Association Rules- Building Classification Rules from Association Rules.

UNIT- III MODELLING 9

Descriptive Modeling- Data Preparation Issues with Descriptive Modeling- Principal ComponentAnalysis- Clustering Algorithms- Interpreting Descriptive Models- Standard Cluster Model Interpretation

UNIT- IV PREDICTIVE MODELLING 9

Decision Trees- Logistic Regression -Neural Network Model – K-Nearest Neighbours – NaiveBayes – Regression Models - Linear Regression - Other Regression Algorithms.

UNIT- V TEXT MINING 9

Motivation for Text Mining- A Predictive Modeling Approach to Text Mining- Structured vs. Unstructured Data- Why Text Mining Is Hard- Data Preparation Steps- Text Mining Features- Modeling with Text Mining Features- Regular Expressions- Case Studies:- Survey Analysis.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dean Abbott	"Applied PredictiveAnalytics-Principles and Techniques for the Professional Data Analyst"	Wiley,	2014
2.	Jiawei Han and Micheline Kamber	Data Mining Concepts and Techniques	ThirdEdition, Elsevier	2012

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Conrad Carlberg	"Predictive Analytics: Microsoft Excel"	1st Edition, Que Publishing	2012
2.	Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani	An Introduction toStatistical Learning with Applications in R	Springer	2013
3.	Alberto Cordoba	"Understanding the Predictive Analytics Lifecycle"	Wiley	2014
4.	Anasse Bari, Mohammad Chaouchi, Tommy Jung,	Predictive Analytics for Dummies	2nd Edition	2017

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19ADE04 **AGILE METHODOLOGIES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
2. To provide a good understanding of software design and a set of software technologies and APIs.
3. To do a detailed examination and demonstration of Agile development and testing techniques.
4. To understand the benefits and pitfalls of working in an Agile team.
5. To understand Agile development and testing.

COURSE OUTCOMES

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

19ADE04.CO1	Realize the importance of interacting with business stakeholders in determining the requirements for a software system
19ADE04.CO2	Perform iterative software development processes: how to plan them, how to execute them.
19ADE04.CO3	Point out the impact of social aspects on software development success.
19ADE04.CO4	Develop techniques and tools for improving team collaboration and software quality.
19ADE04.CO5	Perform Software process improvement as an ongoing task for development teams.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE04.CO1	x	-	x	-	x	-	x	-	-	x	-	x	-	x	-
19ADE04.CO2	x	-	x	-	-	x	-	x	x	x	-	-	x	-	-
19ADE04.CO3	x	x	-	x	x	x	-	x	x	x	-	-	-	x	-
19ADE04.CO4	x	-	x	-	-	-	-	-	x	x	x	x	-	x	x
19ADE04.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I AGILE METHODOLOGY **9**

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT- II AGILE PROCESSES **9**

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT- III AGILITY AND KNOWLEDGE MANAGEMENT **9**

Agile Information Systems – Agile Decision Making - Earl'S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT- IV AGILITY AND REQUIREMENTS ENGINEERING **9**

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile

– Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT- V AGILITY AND QUALITY ASSURANCE **9**

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development –
Agile Approach in Global Software Development.

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	David J. Anderson and Eli Schragenheim	Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results	Prentice Hall	2003
2.	Hazza and Dubinsky	Agile Software Engineering, Series: Undergraduate Topics in Computer Science	Springer	2009

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Craig Larman	Agile and Iterative Development: A Manager's Guide	Addison-Wesley	2004
2.	Kevin C. Desouza	Agile Information Systems: Conceptualization, Construction, and Management	Butterworth-Heinemann	2007

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19ADE05	PARALLEL COMPUTING	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To understand different parallelism techniques.
2. To know parallel architecture.
3. To learn about parallel algorithm design
4. Understand parallel programming
5. Learn about the interpretation of parallel programming

COURSE OUTCOMES

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

19ADE05.CO1 Understand different parallel computing technique
19ADE05.CO2 Learn parallel computing architecture
19ADE05.CO3 Learn to design parallel algorithms
19ADE05.CO4 Understand how to develop parallel program
19ADE05.CO5 Know compiler interpretation of parallel programming

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE05.CO1	x	-	x	-	x	-	x	-	-	x	-	x	-	x	-
19ADE05.CO2	x	-	x	-	-	x	-	x	x	x	-	-	x	-	-
19ADE05.CO3	x	x	-	x	x	x	-	x	x	x	-	-	-	x	-
19ADE05.CO4	x	-	x	-	-	-	-	-	x	x	x	x	-	x	x
19ADE05.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I INTRODUCTION 9

Historical progression leading to current state – types of parallism including temporal, data and functional. Instructional level parallelism – pipelined processors – super scalar processors – VLIW processors – multithreaded processors – proposed future processors including trace, multiscalar and super flow – case studies

UNIT- II PARALLEL ARCHITECTURES 9

Classification – inter connection networks – vector computers – shared memory parallel computers – cache coherence – distributed shared memory parallel computers – message passing parallel computers – cluster of workstations.

UNIT- III PARALLEL ALGORITHMS PLATFORM 9

Preliminaries – decomposition techniques – characteristics of tasks and interactions – mapping techniques for load balancing – methods for containing interaction overheads – parallel algorithm models.

UNIT- IV PARALLEL PROGRAMMING DESGN 9

Trends in microprocessor architectures - limitations of memory system performance – parallel computing platforms – communication costs in parallel machines – routing mechanisms for interconnection networks.

UNIT- V COMPILER TRANSFORMATIONS AND PERFORMANCE EVALUATION 9

Dependence analysis loop transformations – transformations for parallel computers including data layouts, computational and communication optimization. Peformance Metrics –performance lows – scalability – performance measurement books.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	V. Rajaraman and C. Siva Ram Murthy	"Parallel Computers – Architecture andProgramming"	Prentice-Hall of India	2003
2.	Ananth Grama, Anshul gupta, George Karypis and Vipin Kumar	"Introduction toParallel Computing"	Pearson Education, Second edition	2004

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Selim G.Akl	The design and analysis of parallel algorithms	Prentice Hall International Inc	1989
2.	Hwang K. Briggs F.A.	Computer Architecture and parallel processing	MCGraw Hill	1985
3.	Shameem Akhter and Jason Roberts	Multi-core Programming	Intel Press	2006

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19ADE06 **SOFTWARE ARCHITECTURE** L T P C 3 0 0 3

COURSE OBJECTIVES:

1. Understand the fundamentals of software architecture.
2. Study the various software development methodologies.
3. Learn the importance of architectural documentation and evaluation.
4. Learn the various software architecture design components.
5. Relate software architecture and software quality.

COURSE OUTCOMES

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

19ADE06.CO1 Develop Software applications starting from software architecture and design.
19ADE06.CO2 Learn and evaluate existing software architectures.
19ADE06.CO3 Realize importance of architectural documentation and document them.
19ADE06.CO4 Employ various software architecture design components.
19ADE06.CO5 Design methods for improving software quality from the perspective of softwarearchitecture.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE06.CO1	x	x	-	x	x	-	x	-	-	x	x	x	-	x	-
19ADE06.CO2	x	-	x	-	-	x	-	x	x	x	-	-	x	-	-
19ADE06.CO3	x	x	x	x	x	x	-	x	x	x	-	-	-	x	-
19ADE06.CO4	x	-	x	-	-	-	x	-	x	x	x	x	-	x	x
19ADE06.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I INTRODUCTION 9

Basic concepts of software architecture – Context of Software Architecture – ABC cycle – What software architecture is and what it isn't – Architectural patterns – Good Architecture- Reference models – Architectural structures and views-Introduction to styles – Decentralized Architectures

UNIT- II DESIGN METHODOLOGIES 9

Structured design- Design practices-Stepwise refinement – Incremental design- Structured system analysis and design –Jackson structured programming – Jackson system Development.

UNIT- III ARCHITECTURAL DESCRIPTION DOCUMENTATION AND EVALUATION 9

Early architecture description languages-Domain and style specific ADL's- Extensible ADL's – Documenting software architecture – Uses and Audiences for Architecture Documentation – Views – Choosing Views – Combining Views –Architecture evaluation – Evaluation Factors – Architecture Tradeoff Analysis Method – Lightweight Architecture Evaluation – ATAM.

UNIT- IV ARCHITECTURE DESIGN 9

Typical architectural design-Dataflow-Independent components-Call and return – Using styles in design – Architectural design space-Design space of architectural elements – Design space of architectural styles.

UNIT- V IMPLEMENTATION AND CONFORMANCE TOARCHITECTURE 9

Understanding quality attributes- Implementation of Quality attributes in Architecture – Architecture and requirements conformance –Functionality– Quality attribute considerations – System quality attributes- Introduction to tactics – Achieving Quality Attributes through Tactics – Tactics types –Architectural patterns and styles – Architecture and Quality Attributes – Quality attribute scenarios in practice.

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Len Bass, Paul Clements, Rick Kazman	Software Architecture in Practice	Third Edition, Addison, Wesley	2012
2.	David Budgen	Software Design	Second Edition, Pearson Education	2004

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Richard N.Taylor, NenadMedvidovic and Eric M.Dashofy	Software Architecture, Foundations, Theory and Practice	Wiley	2010
2.	Hong Zhu	Software Design Methodology from Principles to Architectural Styles	Elsevier	2005
3.	Mary Shaw and David Garlan	Software Architecture –Perspectives on an emergingDiscipline	Pearson Education	2008

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19ADE07	INTERNET OF THINGS	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To understand Smart Objects and IoT Architectures
2. To learn about various IOT-related protocols
3. To build simple IoT Systems using Arduino and Raspberry Pi.
4. To understand data analytics and cloud in the context of IoT
5. To develop IoT infrastructure for popular applications

COURSE OUTCOMES

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

19ADE07.CO1 Explain the concept of IoT.
19ADE07.CO2 Analyze various protocols for IoT.
19ADE07.CO3 Design a PoC of an IoT system using Rasperry Pi/Arduino
19ADE07.CO4 Apply data analytics and use cloud offerings related to IoT.
19ADE07.CO5 Analyze applications of IoT in real time scenario

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE07.CO1	x	-	-	-	x	-	x	-	-	-	x	x	-	x	-
19ADE07.CO2	x	-	x	x	-	x	-	x	x	x	-	-	x	-	-
19ADE07.CO3	x	x	-	-	x	x	-	x	x	x	-	-	-	x	-
19ADE07.CO4	x	-	x	-	-	-	x	-	x	x	x	-	-	x	-
19ADE07.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I FUNDAMENTALS OF IoT 9

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT- II IoT PROTOCOLS 9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT- III DESIGN AND DEVELOPMENT 9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT- IV DATA ANALYTICS AND SUPPORTING SERVICES 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

UNIT- V CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

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Text Books:

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

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Olivier Hersent, David Boswarthick, Omar Elloumi	The Internet of Things – Key applications and Protocols	Wiley	2012
2.	Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle	From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence	Elsevier	2014
3.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds)	Architecting the Internet of Things	Springer	2011
4.	Michael Margolis, Arduino Cookbook	Recipes to Begin, Expand, and Enhance Your Projects	2nd Edition, O'Reilly Media	2011

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19ADE08 **HEALTH CARE ANALYTICS** L T P C 3 0 0 3

COURSE OBJECTIVES:

1. Understand the health data formats, health care policy and standards
2. Learn the significance and need of data analysis and data visualization
3. Understand the health data management frameworks
4. Learn the use of machine learning and deep learning algorithms in healthcare
5. Apply healthcare analytics for critical care applications

COURSE OUTCOMES

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

19ADE08.CO1	Use machine learning and deep learning algorithms for health data analysis
19ADE08.CO2	Apply the data management techniques for healthcare data
19ADE08.CO3	Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications
19ADE08.CO4	Design health data analytics for real time applications
19ADE08.CO5	Design emergency care system using health data analysis

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE08.CO1	x	-	-	-	x	-	x	-	-	-	x	x	-	x	-
19ADE08.CO2	x	-	x	x	-	x	-	x	x	x	-	-	x	-	-
19ADE08.CO3	x	x	-	-	x	x	-	x	x	x	-	-	-	x	-
19ADE08.CO4	x	-	x	-	-	-	x	-	x	x	x	-	-	x	-
19ADE08.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I INTRODUCTION TO HEALTHCARE ANALYSIS 9

Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning , Probabilistic reasoning and Bayes Theorem, Weighted sum approach.

UNIT- II ANALYTICS ON MACHINE LEARNING 9

Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model : Sensitivity , Specificity , PPV ,NPV, FPR ,Accuracy , ROC , Precision Recall Curves , Valued target variables –Python: Variables and types, Data Structures and containers , Pandas Data Frame :Operations – Scikit –Learn : Pre-processing , Feature Selection.

UNIT- III HEALTH CARE MANAGEMENT 9

IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.

UNIT- IV HEALTHCARE AND DEEP LEARNING 9

Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.

UNIT- V CASE STUDIES 9

Predicting Mortality for cardiology Practice –Smart Ambulance System using IOT –Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Chandan K.Reddy, Charu C. Aggarwal	Health Care data Analysis	First edition, CRC	2015
2.	Vikas Kumar	Health Care Analysis Made Simple	Packt Publishing	2018

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Nilanjan Dey, Amira Ashour , Simon James Fong, Chintan Bhatl	Health Care Data Analysis and Management	First Edition, Academic Press	2018
2.	Hui Jang, Eva K.Lee	HealthCare Analysis : From Data to Knowledge to Healthcare Improvement	First Edition, Wiley	2016
3.	Kulkarni , Siarry, Singh ,Abraham, Zhang, Zomaya , Baki	Big Data Analytics in HealthCare	Springer	2020

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19ADE09 **DISTRIBUTED SYSTEMS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To understand the foundations of distributed systems.
2. To learn issues related to clock Synchronization and the need for global state in distributed systems.
3. To learn distributed mutual exclusion and deadlock detection algorithms.
4. To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
5. To learn the characteristics of peer-to-peer and distributed shared memory systems.

COURSE OUTCOMES

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

19ADE09.CO1 Elucidate the foundations and issues of distributed systems
19ADE09.CO2 Understand the various synchronization issues and global state for distributed systems.
19ADE09.CO3 Understand the Mutual Exclusion and Deadlock detection algorithms in distributed systems
19ADE09.CO4 Describe the agreement protocols and fault tolerance mechanisms in distributed systems.
19ADE09.CO5 Describe the features of peer-to-peer and distributed shared memory systems

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE09.CO1	x	-	-	-	x	-	x	-	-	-	x	x	-	x	-
19ADE09.CO2	x	-	x	x	-	x	-	x	x	x	-	-	x	-	-
19ADE09.CO3	x	x	-	-	x	x	-	x	x	x	-	-	-	x	-
19ADE09.CO4	x	-	x	-	-	-	x	-	x	x	x	-	-	x	-
19ADE09.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I INTRODUCTION 9

Introduction: Definition –Relation to computer system components –Motivation –Relation to parallel systems –Message-passing systems versus shared memory systems –Primitives for distributed communication –Synchronous versus asynchronous executions –Design issues and challenges. A model of distributed computations: A distributed program –A model of distributed executions –Models of communication networks –Global state – Cuts –Past and future cones of an event –Models of process communications. Logical Time: A framework for a system of logical clocks –Scalar time –Vector time – Physical clock synchronization: NTP.

UNIT- II MESSAGE ORDERING & SNAPSHOTS 9

Message ordering and group communication: Message ordering paradigms –Asynchronous execution with synchronous communication –Synchronous program order on an asynchronous system –Group communication – Causal order (CO) - Total order. Global state and snapshot recording algorithms: Introduction –System model and definitions – Snapshot algorithms for FIFO channels

UNIT- III DISTRIBUTED MUTEX & DEADLOCK 9

Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart-Agrawala algorithm – Maekawa's algorithm – Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp's classification – Algorithms for the single resource model, the AND model and the OR model.

UNIT- IV RECOVERY & CONSENSUS 9

Checkpointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated checkpointing algorithm – Algorithm for asynchronous checkpointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.

UNIT- V P2P & DISTRIBUTED SHARED MEMORY 9

Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry. Distributed shared memory: Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kshemkalyani, Ajay D., and Mukesh Singhal	Distributed computing: principles, algorithms, and systems	Cambridge University Press	2011
2.	George Coulouris, Jean Dollimore and Tim Kindberg	Distributed Systems Concepts and Design	Fifth Edition, Pearson Education	2012

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Pradeep K Sinha	Distributed Operating Systems: Concepts and Design	Prentice Hall ofIndia	2007
2.	Mukesh Singhal and Niranjan G. Shivaratri	Advanced concepts in operating systems	McGraw-Hill, Inc.,	1994
3.	Tanenbaum A.S., Van Steen M.,	Distributed Systems: Principles and Paradigms	PearsonEducation	2007
4.	Liu M.L.,	Distributed Computing, Principles and Applications	Pearson Education	2004
5.	Nancy A Lynch	Distributed Algorithms	Morgan Kaufman Publishers, USA	2003

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19ADE10 **MOBILE APPLICATIONS DEVELOPMENT** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. Understand system requirements for mobile applications
2. Generate suitable design using specific mobile development frameworks
3. Generate mobile application design
4. Implement the design using specific mobile development frameworks
5. Deploy the mobile applications in marketplace for distribution

COURSE OUTCOMES

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

19ADE10.CO1 Describe the requirements for mobile applications
19ADE10.CO2 Design user interface for mobile applications
19ADE10.CO3 Store mobile data of android applications
19ADE10.CO4 Evaluate native capabilities of android applications
19ADE10.CO5 Design iOS applications with tools

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE10.CO1	x	-	-	-	x	-	x	-	-	-	x	x	-	x	-
19ADE10.CO2	x	-	x	x	-	x	-	x	x	x	-	-	x	-	-
19ADE10.CO3	x	x	-	-	x	x	-	x	x	x	-	-	-	x	-
19ADE10.CO4	x	-	x	-	-	-	x	-	x	x	x	-	-	x	-
19ADE10.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I INTRODUCTION TO MOBILE APPLICATIONS 9

Web Vs mobile App – Cost of Development – Myths - Mobile Applications – Marketing - Mobile User Interface Design - Effective Use of Screen – Mobile Users - Mobile Information Design - Mobile Platforms - Tools of Mobile Interface Design

UNIT- II ANDROID USER INTERFACE DESIGN 9

Android Architecture – Android SDK Tools - Application Components - Intents - Content providers - Broadcast receivers – Services - User Interface Design - Views - View Groups – Layouts - Event Handling – Listeners – Adapters – Menus - Action Bars – Notifications - Android Localization

UNIT- III ANDROID DATA STORAGE 9

Content Providers – Uri - CRUD access –Browser – CallLog – Contacts – Media Store - Data Access and Storage - Shared Preferences - Storage External - Network Connection - SQLite Databases

UNIT- IV ANDROID NATIVE CAPABILITIES 9

Camera – Audio - Sensors and Bluetooth - Playing audio/video - Media recording - Sensors - Listening to sensor readings – Bluetooth - Android Communications – GPS - Working with Location Manager, Working with Google Maps extensions - Maps via intent - Map Activity - Location based Services - Location Updates - Location Providers - Selecting a Location Provider - Finding Location

UNIT- V IOS DESIGN 9

iPhone Craze – iOS Features – iOS Tools - iOS Project – Objective C Basics – Building iOS App – Actions and Outlets – Delegates - User Interface Elements – Accelerometer – Location Handling - SQLite Database

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jeff McWherter and Scott Gowell	Professional Mobile Application Development	Wrox	2012
2.	Reto Meier	Professional Android 4 Development	John Wiley and Sons	2012

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson	Beginning iOS 6Development: Exploring the iOS SDK	Apress	2013

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19ADE11 SOFTWARE TESTING AND QUALITYASSURANCE **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To understand the basics of testing, planning, designing and managing test cases.
2. To study the various types of test in the life cycle of the software product.
3. To build design concepts for system testing and execution.
4. To learn the software quality assurance ,metrics, defect prevention techniques
5. To learn the techniques for quality assurance and applying for applications.

COURSE OUTCOMES

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

19ADE11.CO1 Understand the testing, planning, designing and managing test cases.

19ADE11.CO2 Perform functional and non-functional tests in the life cycle of the software product.

19ADE11.CO3 Understand system testing and test execution process.

19ADE11.CO4 Identify defect prevention techniques and software quality assurance metrics.

19ADE11.CO5 Apply techniques of quality assurance for typical applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE11.CO1	x	x	-	-	x	-	x	-	-	x	x	x	-	x	-
19ADE11.CO2	x	-	x	x	-	x	-	x	x	x	-	-	x	-	-
19ADE11.CO3	x	x	-	-	x	x	-	x	-	-	-	-	-	-	-
19ADE11.CO4	x	-	x	-	-	-	x	-	x	x	x	-	-	x	-
19ADE11.CO5	x	x	-	x	x	-	-	-	x	-	x	x	x	-	x

UNIT- I SOFTWARE TESTING - CONCEPTS, ISSUES, AND TECHNIQUES 9

Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, COURSE OBJECTIVES of Testing, Testing Activities, Test Case Selection White-Box and Black, test Planning and design, Test Tools and Automation. Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group, System Test Team Hierarchy, Team Building

UNIT- II SYSTEM TESTING 9

System Testing - System Integration Techniques-Incremental, Top Down Bottom Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built- in Testing. Functional testing - Testing a Function in Context. Boundary Value Analysis, Decision Tables. acceptance testing - Selection of Acceptance Criteria, Acceptance Test Plan, Test Execution Test. software reliability - Fault and Failure, Factors Influencing Software, Reliability Models

UNIT- III SYSTEM TEST CATEGORIES 9

System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests. Robustness Tests, Boundary Value Tests Power Cycling Tests Interoperability Tests, Scalability Tests, Stress Tests. Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests. Test Generation from FSM models- State-Oriented Model. Finite-State Machine Transition Tour Method, Testing with State Verification. Test Architectures-Local, distributed, Coordinated, Remote system test design- Test Design Factors Requirement Identification, modeling a Test Design Process Test Design Preparedness, Metrics, Test Case Design Effectiveness. System test execution- Modeling Defects, Metrics for Monitoring Test Execution .Defect Reports, Defect Causal Analysis, Beta testing, measuring Test Effectiveness.

UNIT- IV SOFTWARE QUALITY 9

Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria – Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models-Test Process Improvement, Testing Maturity Model.

UNIT- V SOFTWARE QUALITY ASSURANCE 9

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kshirasagar Naik, Priyadarshi Tripathy	Software Testing And Quality Assurance-Theory and Practice	John Wiley & Sons Inc	2008
2.	Daniel Galin	Software Quality Assurance - From Theory to Implementation	PearsonEducation Ltd UK	2004

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hoboken, New Jersey	Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement	John Wiley & Sons, Inc.,	2005
2.	Milind Limaye	Software Quality Assurance	TMH ,New Delhi	2011
3.	Aditya P. Mathur	Foundations of Software Testing _ Fundamental Algorithms and Techniques	Dorling Kindersley (India) Pvt. Ltd., Pearson Education	2008

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19ADE12 **CLOUD COMPUTING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To understand the concept of cloud computing.
2. To appreciate the evolution of cloud from the existing technologies.
3. To have knowledge on the various issues in cloud computing.
4. To be familiar with the lead players in cloud.
5. To appreciate the emergence of cloud as the next generation computing paradigm.

COURSE OUTCOMES

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

19ADE12.CO1	Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
19ADE12.CO2	Learn the key and enabling technologies that help in the development of cloud.
19ADE12.CO3	Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
19ADE12.CO4	Explain the core issues of cloud computing such as resource management and security.
19ADE12.CO5	Evaluate and choose the appropriate technologies, algorithms and approaches forimplementation and use of cloud.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE12.CO1	x	-	-	-	x	-	x	-	-	-	x	x	-	x	-
19ADE12.CO2	x	-	x	x	-	x	-	x	x	x	-	-	x	-	-
19ADE12.CO3	x	x	-	-	x	x	-	x	x	x	-	-	-	x	-
19ADE12.CO4	x	-	x	-	-	-	x	-	x	x	x	-	-	x	-
19ADE12.CO5	x	x	x	x	x	-	x	-	x	-	x	x	-	-	x

UNIT- I INTRODUCTION **9**

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning

UNIT- II CLOUD ENABLING TECHNOLOGIES **9**

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish- Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

UNIT- III CLOUD ARCHITECTURE, SERVICES AND STORAGE **9**

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT- IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD **9**

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security– IAM – Security Standards.

UNIT- V CLOUD TECHNOLOGIES AND ADVANCEMENTS **9**

Hadoop – MapReduce – Virtual Box -- Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

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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, FromParallel Processing to the Internet of Things	Morgan Kaufmann Publishers	2012
2.	Rittinghouse, John W., and James F. Ransome	Cloud Computing: Implementation, Management and Security	CRC Press	2017

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi	Mastering Cloud Computing	Tata Mcgraw Hill	2013
2.	Toby Velte, Anthony Velte, Robert Elsenpeter	Cloud Computing - A Practical Approach	Tata Mcgraw Hill	2009
3.	George Reese	Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)	O'Reilly	2009

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19ADE13 **EMBEDDED SYSTEMS ANDPROGRAMMING** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To understand the architecture of embedded processors, microcontrollers and peripheral devices
2. To learn programming the embedded processor in assembly
3. To understand the challenges in developing operating systems for embeddedsystems
4. To learn programming the embedded systems in high level language such as C
5. To understand the Real time operating systems

COURSE OUTCOMES

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

19ADE13.CO1 Understand the embedded systems
19ADE13.CO2 Learn the embedded systems Architecture
19ADE13.CO3 Understand the embedded systems programming
19ADE13.CO4 Learn about the real time operating systems
19ADE13.CO5 Understand the concept on micro C

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE13.CO1	x	-	x	-	-	x	x	-	x	-	x	x	-	-	x
19ADE13.CO2	x	-	-	x	-	x	-	x	x	x	-	-	x	x	-
19ADE13.CO3	x	x	-	-	x	x	-	x	-	x	-	-	-	-	-
19ADE13.CO4	x	-	x	-	-	-	x	-	x	x	x	-	-	x	-
19ADE13.CO5	x	x	x	x	x	-	x	-	x	-	x	x	x	-	-

UNIT- I INTRODUCTION TO EMBEDDED SYSTEM 9

Components of Embedded System – Classification - Characteristic of embedded system- Microprocessors & Micro controllers- Introduction to embedded processors - Embedded software architectures: Simple control loop - Interrupt controlled system - Cooperative multitasking - Preemptive multitasking or multi-threading - Micro kernels and kernels - Monolithic kernels -
Exotic custom operating systems.

UNIT- II EMBEDDED HARDWARE ARCHITECTURE 9

ARM 2 TDMI core based 32 Bitmicrocontrollers and family of processors, Register, Memory and Data transfer, Arithmetic and Logic instructions, Assembly Language, I/O operations interrupt structure, ARM cache. ARMBus, Embedded systems with ARM.

UNIT- III REAL TIME OPERATING SYSTEMS 9

Tasking Models, Task States, Services and Transitions - Real- Time Scheduling Algorithms: Round-Robin, FIFO, Priority-Based Preemptive Scheduling - Rate-Monotonic Scheduling - Priority Inversion and Priority Ceiling - Deadlocks - Process Synchronization – IPC - Shared Memory, Memory Locking, Memory Allocation - Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual Sockets.

UNIT- IV SOFTWARE DEVELOPMENT 9

Embedded Programming in C and C++ - Source Code Engineering Toolsfor Embedded C/C++- Program Modeling Concepts in Single and Multiprocessor Systems - Software Development Process - Software Engineering Practices in the Embedded Software Development – Hardware / Software Co-design in an Embedded System

UNIT- V STUDY OF MICRO C/OS-II 9

RTOS System Level Functions – Task Service Functions Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions Mailbox Related Functions – Queue Related Functions – Case Studies of Programming withRTOS.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rajkamal	Embedded System: Architecture, Programming and Design	Tata McGraw- Hill	2003
2.	Wayne Wolf	Computers as Components – Principles of Embedded Computing System Design	Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, First Indian Reprint	2001

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Steve Heath	Embedded Systems Design	Newnes, Second edition	2003
2.	Noergaard	Embedded System Architecture	Elsevier India Private Limited	2005
3.	Sriram Iyer and Pankaj Gupta	Embedded Real Time Systems Programming	TataMcGraw-Hill	2004

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19ADE14 OPERATIONS AND SUPPLY CHAINMANAGEMENT **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To provide an insight on the operations
2. To provide quality management and sampling tools
3. To analyze fundamentals of supply chain networks
4. To develop tools and techniques
5. To understand supplier relationship management

COURSE OUTCOMES

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

19ADE14.CO1 To know about the operations and fundamentals of supply chain
19ADE14.CO2 To understand the quality management tools and sampling process
19ADE14.CO3 To understand the design factors and various design options of distribution networks in industries and the role of transportation and warehousing
19ADE14.CO4 To understand the various sourcing decisions in supply chain
19ADE14.CO5 To understand the supply chain management in IT industries

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE14.CO1	x	-	x	-	-	x	x	-	x	-	x	x	-	-	x
19ADE14.CO2	x	-	-	x	-	x	-	x	x	x	-	-	x	x	-
19ADE14.CO3	x	x	-	-	x	x	-	x	-	x	-	-	-	-	-
19ADE14.CO4	x	-	x	-	-	-	x	-	x	x	x	-	-	x	-
19ADE14.CO5	x	x	x	x	x	-	x	-	x	-	x	x	x	-	-

UNIT- I INTRODUCTION TO OPERATIONS AND SUPPLY CHAIN MANAGEMENT **9**

Scope and Importance- Evolution of Supply Chain - Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles - The Operations Function - The Evolution of Operations and Supply Chain Management – Globalization - Productivity and Competitiveness - Strategy and Operations-Operational Decision-Making Tools: Decision Analysis-Decision Analysis with and without Probabilities

UNIT- II QUALITY MANAGEMENT **9**

Quality and Value in Athletic Shoes -What Is Quality-Quality Management System-Quality Tools- Quality in Services-Six Sigma-Quality Costs and Productivity-Quality Awards-ISO 9000-Statistical Process Control-Operational Decision-Making Tools: Acceptance Samp

UNIT- III NETWORK DESIGN AND TRANSPORTATION **9**

Factors influencing Distribution network design – Design options for Distribution Network— factors affecting transportations decision – Design option for transportation network – Tailored transportation – Routing and scheduling in transportation

UNIT- IV SOURCING AND COORDINATION **9**

Role of sourcing supply chain - supplier selection assessment and contracts- Design collaboration - sourcing planning and analysis - supply chain co-ordination - Bull whip effect – Effect of lack of co- ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

UNIT- V SUPPLY CHAIN AND INFORMATION TECHNOLOGY **9**

The role IT in supply chain- The supply chain IT frame work - Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain – E-Business in supply chain.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Roberta S. Russell, Bernard W. Taylor	Operations and Supply Chain Management	10thEdition, Wiley Publications	2019
2.	Sunil Chopra, Peter Meindl and Kalra	Supply Chain Management, Strategy, Planning, andOperation	Pearson Education	2010

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jeremy F.Shapiro	Modeling the Supply Chain	Thomson Duxbury	2002
2.	Srinivasan G.S	Quantitative models in Operations and Supply Chain Management	PHI	2010
3.	David J.Bloomberg , Stephen Lemay and Joe B.Hanna	Logistics	PHI	2002
4.	James B.Ayers	Handbook of Supply Chain Management	St.Lucle press	2000
5.	F. Robert Jacobs (Author), Richard B. Chase	Operations and Supply Chain Management	McGraw Hill	2017

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19ADE15 **SPEECH PROCESSING AND ANALYTICS** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To understand the need for morphological processing and their representation
2. To know about the various techniques used for speech synthesis and recognition
3. To appreciate the syntax analysis and parsing that is essential for natural language processing
4. To learn about the various representations of semantics and discourse
5. To have knowledge about the applications of natural language processing

COURSE OUTCOMES

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

19ADE15.CO1 Identify the different linguistic components of natural language
19ADE15.CO2 Design a morphological analyser for a given natural language
19ADE15.CO3 Decide on the appropriate parsing techniques necessary for a given language and application
19ADE15.CO4 Design new tagset and a tagger for a given natural language
19ADE15.CO5 Design applications involving natural language

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE15.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE15.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE15.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE15.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE15.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I SPEECH PROCESSING 9

Phonetics –Articulatory Phonetics -Phonological Categories -Acoustic Phonetics and Signals - Speech Synthesis – Text Normalization –Phonetic and Acoustic Analysis -Diphone Waveform synthesis –Evaluation-Automatic Speech Recognition –Architecture -Hidden Markov Model to Speech -MFCC vectors -Acoustic Likelihood Computation - Evaluation. Triphones – Discriminative Training -Modeling Variation. Computational Phonology- Finite-State Phonology–Computational Optimality Theory -Syllabification -Learning Phonology and Morphology

UNIT- II SPEECH ANALYSIS 9

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients. Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths

UNIT- III SPEECH MODELING 9

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

UNIT- IV SPEECH RECOGNITION 9

Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, contextdependent sub-word units; Applications and present status.

UNIT- V SPEECH SYNTHESIS 9

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units forTTS, intelligibility and naturalness – role of prosody, Applications and present status.

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jurafsky and Martin	Speech and Language Processing	Pearson Prentice Hall,Second Edition	2008
2.	Lawrence Rabinerand Biing-Hwang Juang	Fundamentals of Speech Recognition	Pearson Education	2003

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Steven W. Smith	The Scientist and Engineer's Guide to Digital Signal Processing	California Technical Publishing	-
2.	Thomas F Quatieri	Discrete-Time Speech Signal Processing – Principles and Practice	Pearson Education	-
3.	Claudio Becchetti and Lucio Prina Ricotti	Speech Recognition	John Wiley and Sons	1999
4.	Ben gold and Nelson Morgan	Speech and audio signal processing processing andperception of speech and music	Wiley- India Edition	2006
5.	Frederick Jelinek	Statistical Methods of Speech Recognition	MIT Press	-

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19ADE16 **SOCIAL NETWORK ANALYTICS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To understand the concept of semantic web and related applications.
2. To learn knowledge representation using ontology.
3. To learn Extraction And Mining Communities
4. To understand human behaviour in social web and related communities.
5. To learn visualization of social networks.

COURSE OUTCOMES

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

19ADE16.CO1 Develop semantic web related applications.
19ADE16.CO2 Represent knowledge using ontology.
19ADE16.CO3 Extracting evolution of Web Community
19ADE16.CO4 Predict human behaviour in social web and related communities.
19ADE16.CO5 Visualize social networks.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE16.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE16.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE16.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE16.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE16.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I INTRODUCTION **9**

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

UNIT- II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION **9**

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships -Aggregating and reasoning with social network data - Advanced representations.

UNIT- III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS **9**

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.

UNIT- IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES **9**

Understanding and predicting human behaviour for social communities - User data management- Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT- V VISUALIZATION AND APPLICATIONS OF SOCIAL ETWORKS **9**

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations- Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Peter Mika	Social Networks and the Semantic Web	First Edition, Springer	2007
2.	Borko Furht	Handbook of Social Network Technologies and Applications	1st Edition, Springer	2010

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Guandong Xu ,Yanchun Zhang and Lin Li	Web Mining and Social Networking – Techniquesand applications	First Edition, Springer	2011
2.	Dion Goh and Schubert Foo	Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively	IGI Global Snippet	2008
3.	Max Chevalier, Christine Julien and Chantal Soulé-Dupuy	Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling	IGI Global Snippet	2009
4.	John G. Breslin, Alexander Passant and Stefan Decker	The Social Semantic Web	Springer	2009

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19ADE17 **CYBER SECURITY** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To study the basics of Cyber security.
2. To know about the security aspects operating systems and networks.
3. To explore Cryptography , IDS and IPS
4. To study the privacy principles and policies.
5. To know about the Security management and incidents.

COURSE OUTCOMES

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

19ADE17.CO1 Explain the basic concepts of computer security
19ADE17.CO2 Devise methods for Security in operating system & networks
19ADE17.CO3 Differentiate the various security counter measures.
19ADE17.CO4 Devise Privacy principles and policies
19ADE17.CO5 Manage the Cyber space.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE17.CO1	x	-	x	-	-	x	x	-	x	-	x	x	-	x	-
19ADE17.CO2	x	-	x	x	-	x	-	x	x	x	-	-	x	-	-
19ADE17.CO3	x	x	-	-	x	-	x	x	-	x	-	-	-	-	
19ADE17.CO4	x	-	x	-	-	x	x	-	x	x	x	-	x	x	-
19ADE17.CO5	x	x	-	x	-	-	-	-	x	-	x	x	-	-	-

UNIT- I INTRODUCTION TO CYBER SECURITY 9

Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls – Authentication- Access Control and Cryptography - Web-User Side - Browser Attacks - Web Attacks- Targeting Users - Obtaining User or Website Data - Email Attacks.

UNIT- II SECURITY iN OPERATING SYSTEM & NETWORKS 9

Security in Operating Systems - Security in the Design of Operating Systems -Rootkit - Network security attack-Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

UNIT- III DEFENCES: SECURITY COUNTER MEASURES 9

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

UNIT- IV PRIVACY IN CYBERSPACE 9

Privacy Concepts -Privacy Principles and Policies -Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies.

UNIT- V MANAGEMENT AND INCIDENTS 9

Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting -Cyber Warfare- Cyberspace and the Law - International Laws - Cyber crime - Cyber Warfare andHome Land Security.

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Jan L.Harrington	Network Security – A Practical Approach	Morgan Kaufmann Publishers –An Imprint of Elsevier	2005
2.	William Stallings	Cryptography and Network Security – Principles and Practice	Pearson Education Asia, Fourth Edition	2005

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Edward Amoroso	Cyber Security	Silicon Press	2006
2.	Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies	Security in Computing	5th Edition , Pearson Education	2015
3.	George K.Kostopoulous	Cyber Space and Cyber Security	CRC Press	2013
4.	MarttiLehto, PekkaNeittaanmäki	Cyber Security: Analytics, Technology and Automationedited	Springer International Publishing Switzerland	2015
5.	Nelson Phillips and EnfingerSteuart	Computer Forensics and Investigations	CengageLearning, New Delhi	2009

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19ADE18 **WEB SERVICES AND API DESIGN** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To understand the types of web services, resources, APIs and their architectures
2. To analyze the web service / API design patterns
3. To understand the design principles and best practices
4. To develop, deploy RESTful web service APIs in JAVA
5. To understand the security concerns.

COURSE OUTCOMES

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

19ADE18.CO1 Use a suitable architecture for a given design problem
19ADE18.CO2 Analyze the types of resources and suitable design patterns for development and deployment
19ADE18.CO3 Create and Analyze front-end and Back end designs
19ADE18.CO4 Deploy RESTful API web services using JAVA
19ADE18.CO5 Implement security best practices for preventing security attacks

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE18.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE18.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE18.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE18.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE18.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I INTRODUCTION 9

Web Services - Building Blocks, Types; Service Oriented architectures - resource oriented architectures, API architectures, Micro services and architectures, HATEOAS, REST, URI, Code on Demand.

UNIT- II RESOURCES AND DESIGN PATTERNS 9

Resources - Identification, Resource Relations, Representations, Parameters, types, methods, Requirements for APIs, Architectural Patterns. Basic and Advanced RESTful API patterns.

UNIT- III RESTFUL API DESIGN PRINCIPLES 9

API front End Design, API back end Design, Identifier Design, Interaction Design with HTTP, Metadata Design, Representation Design, URI design, REST constraints, Best Practices.

UNIT- IV DEVELOPMENT AND DEPOLYMENT 9

Frameworks, Standard Languages, API Description Languages, Handover points, Development and Deployment of RESTful web service applications in Java, microservice API, Best Practices.

UNIT- V PERFORMANCE AND SECURITY 9

Performance and availability - caching - Traffic shaping - Evolution and versioning, Security concerns - Mechanisms, Authentication, Validation, Access Control, Token Based Authentication, Authorization.

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Matthias Biehl	RESTful API Design, API University Series	1st Edition, CreateSpace Independent Publishing Platform	2016
2.	Mark Masse	REST API Design Rulebook: Designing Consistent RESTful Web ServiceInterfaces	1st Edition, O' Reilly	2011

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Harihara Subramanian, Pethuru Raj	Hands-On RESTful API Design Patterns and BestPractices: Design, develop, and deploy highly adaptable, scalable, and secure "RESTful web APIs	Packt Publishing	2019
2.	JJ Geewax	API Design Patterns	1st Edition, Manning Publications	2021
3.	Bogunuva Mohanram Balachandar	Restful Java Web Services: A pragmatic guide to designing and building RESTful APIs using Java	3rd Edition, Ingram Short Title	2017

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19ADE19 **NONLINEAR OPTIMIZATION** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To understand the role of optimization techniques and its importance in engineering
2. To introduce the concept of nonlinear optimization methods.
3. To realize the application of non-traditional optimization algorithms
4. To choose appropriate optimization method and solve real world problems.
5. To understand the concept of Advanced Non-Linear Optimization

COURSE OUTCOMES

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

19ADE19.CO1	Comprehend the need and applications of the optimization methods
19ADE19.CO2	understand basic theoretical principles for formulation of optimization models and its solution.
19ADE19.CO3	learn the unified and exact mathematical basis as well as the general principles of various soft computing techniques
19ADE19.CO4	Apply detailed theoretical and practical aspects of intelligent modelling
19ADE19.CO5	Apply detailed aspects of optimization andcontrol of non-linear systems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE19.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE19.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE19.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE19.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE19.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I **CLASSICAL OPTIMIZATION TECHNIQUES** 9

Single variable optimization, Constrained and unconstrained multi-variable optimization, Direct substitution method, Lagrange's method of multipliers,Karush-Kuhn-Tucker conditions

UNIT- II **NON-LINEAR PROGRAMMING: ONE-DIMENSIONAL MINIMIZATIONMETHOD** 9

Unimodal function, Unrestricted search, Exhaustive search, Dichotomous search, Interval halving method, Fibonacci method, Golden section method, Direct root methods

UNIT- III **NON-LINEAR PROGRAMMING: UNCONSTRAINED OPTIMIZATION TECHNIQUES** 9

Direct Search Methods: Random search methods, Grid search method, Univariate method, Hookes and Jeeves' method, Powell's method Indirect Search Methods: Steepest descent method, Fletcher-Reeves method, Newton's method

UNIT- IV **NON-LINEAR PROGRAMMING: CONSTRAINED OPTIMIZATION TECHNIQUES** 9

Direct Methods: Random search method, Sequential linear programming, Indirect methods: Transformation techniques, Exterior penalty function method, Interior penalty function method

UNIT- V **ADVANCED NON-LINEAR OPTIMIZATION** 9

Genetic Algorithms -Working principle-Genetic operators-Numerical problem-Simulated Annealing – Numerical problem - Neural network based optimization-Optimization of fuzzy systems-fuzzy set theory-computational procedure

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	S.S.Rao	Engineering Optimization Theory and Practice	New Age International (P),5th edition	2019
2.	C. B Gupta	Optimization Techniques in Operation Research	I.K.International House Pvt.Ltd	2007

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Godfrey C. Onwubolu, B. V. Babu	New Optimization Techniques in Engineering		2004
2.	Cesar Lopez	MATLAB Optimization Techniques		2014

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19ADE20	ETHICS OF AI	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To understand the need for ensuring ethics in AI
2. To understand ethical issues with the development of AI agents
3. To apply the ethical considerations in different AI applications
4. To evaluate the relation of ethics with nature
5. To overcome the risk for Human rights and other fundamental values.

COURSE OUTCOMES

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

19ADE20.CO1	Understand the ethical issues in the development of AI agents
19ADE20.CO2	Learn the ethical considerations of AI with perspectives on ethical values
19ADE20.CO3	Apply the ethical policies in AI based applications and Robot development
19ADE20.CO4	To implement the AI concepts to societal problems by adapting the legal concepts bysecuring fundamental rights.
19ADE20.CO5	This study will help to overcome the evil genesis in the concepts of AI.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE20.CO1	x	x	-	-	x	x	-	-	x	-	x	x	-	x	-
19ADE20.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	-
19ADE20.CO3	x	x	-	-	x	-	-	x	-	x	-	-	x	-	x
19ADE20.CO4	x	-	x	x	-	x	x	-	x	x	x	-	-	-	-
19ADE20.CO5	x	x	-	x	-	-	x	-	x	-	x	x	x	x	-

UNIT- I INTRODUCTION TO ETHICS OF AI 9

Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities

UNIT- II FRAMEWORK AND MODELS 9

AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral

UNIT- III CONCEPTS AND ISSUES 9

Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder

UNIT- IV PERSPECTIVES AND APPROACHES 9

Perspectives on Ethics of AI, Integrating ethical values and economic value, Automating origination, AI a Binary approach, Machine learning values, Artificial Moral Agents

UNIT- V CASES AND APPLICATION 9

Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Paula Boddington	Towards a Code of Ethics for Artificial Intelligence	Springer	2017
2.	Markus D. Dubber, Frank Pasquale, Sunit Das	The Oxford Handbook of Ethics of AI	Oxford University Press Edited book	2020

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	S. Matthew Liao	Ethics of Artificial Intelligence	Oxford University Press Edited Book	2020
2.	N. Bostrom and E. Yudkowsky	The ethics of artificial intelligence	Cambridge University Press	2014
3.	Wallach, W., & Allen, C	Moral machines: ceaching robots right from wrong	Oxford University Press	2008

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19ADE21 **ENGINEERING ECONOMICS** L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To Learn the fundamental of Economics.
2. To Understand different methods of depreciation use for calculation
3. To know the various method of comparison used in economic
4. To Understand how funds are managed in an organization.
5. Different methods of production and marketing adopted in an industry.

COURSE OUTCOMES

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

19ADE21.CO1 The basic concepts of economics are learned
19ADE21.CO2 Understand the various types depreciation used
19ADE21.CO3 Learn the different comparison technique used in industries.
19ADE21.CO4 The fund flow in the industries are learned
19ADE21.CO5 Understand the different Production and Marketing techniques used in the industries.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE21.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE21.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE21.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE21.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE21.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I MICRO AND MACRO ECONOMICS AND ITSAPPLICATIONS 9

Introduction – Micro Economics – Macro Economics – Economic decisions and Technical Decisions – Demand and Supply Concepts – Elasticity of Demand – Cost of Products – Price of products – Break-Even Analysis – Nature of Functioning of Money –Notional Income – GNPand Savings – Inflation and Deflation Concepts

UNIT- II METHODS OF DEPRECIATION 9

Straight line method of Depreciation- Declining Balance Method of Depreciation-Sum of the Years Digits Method of Depreciation-Sinking Fund Method of Depreciation- Service-output Method of Depreciation.

UNIT- III METHODS OF COMPARISON OF ALTERNATIVES 9

Introduction – Elementary Economic Analysis – Interest Formulas and their Applications Comparisons – Present Worth Method – Future Worth Method – Annual Equivalent Method – Rate of Return Method.

UNIT- IV FINANCIAL MANAGEMENT 9

Sources of finance, internal and external-preparation of balance sheet and profit and loss statements, Types of accounting and significance of each type, interest formulas and their applications.

UNIT- V PRODUCTION & MARKETING MANAGEMENT 9

Types of Production; process of planning, scheduling, Routing, material control; product concept concepts of productivity. Core concepts of Marketing- Needs, Wants, Demand- Marketing Vs Selling- Products and Markets- Pricing and its related factors- Channels of Distribution- Promotion- Advertising- Market Research- Sales Forecasting.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	O.P. Khanna	Industrial Engineering and Management	Dhanpat Rai and Sons	-
2.	R. Pannerselvam	Engineering Economics	Prentice Hall of India Pvt	2014

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S.K. Jain	Applied Economics for Engineers and Managers	Vikas Publications House, New Delhi	1997
2.	Mote Paul, Gupta	Managerial Economics	Tata Mc Graw Hill	1987
3.	Joseph L. Massie	Essentials of Management	Prentice-Hall of India, Third edition	1979

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19ADE22 **PYTHON FOR DATA SCIENCE** L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To acquire skills in data preparatory and preprocessing steps
2. To understand the mathematical skills in statistics
3. To learn the tools and packages in Python for data science
4. To gain understanding in classification and Regression Model
5. To acquire knowledge in data interpretation and visualization techniques

COURSE OUTCOMES

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

19ADE22.CO1 Apply the skills of data inspecting and cleansing.
19ADE22.CO2 Determine the relationship between data dependencies using statistics
19ADE22.CO3 Can handle data using primary tools used for data science in Python
19ADE22.CO4 Represent the useful information using mathematical skills
19ADE22.CO5 Can apply the knowledge for data describing and visualization using tools.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE22.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE22.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE22.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE22.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE22.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I INTRODUCTION 9

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications

UNIT- II DESCRIBING DATA I 9

Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation – degrees of freedom – interquartile range – variability for qualitative and ranked data

UNIT- III PYTHON FOR DATA HANDLING 9

Basics of Numpy arrays – aggregations – computations on arrays – comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

UNIT- IV DESCRIBING DATA II 9

Normal distributions – z scores – normal curve problems – finding proportions – finding scores – more about z scores – correlation – scatter plots – correlation coefficient for quantitative data – computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of r2 – multiple regression equations – regression toward the mean

UNIT- V PYTHON FOR DATA VISUALIZATION 9

Visualization with matplotlib – line plots – scatter plots – visualizing errors – density and contour plots – histograms, binnings, and density – three dimensional plotting – geographic data – data analysis using statmodels and seaborn – graph plotting using Plotly – interactive data visualization using Bokeh

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David Cielen, Arno D. B. Meysman, and Mohamed Ali	Introducing Data Science	ManningPublications	2016
2.	Robert S. Witte and John S. Witte	Statistics	Eleventh Edition, Wiley Publications	2017

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jake VanderPlas	Python Data Science Handbook	O'Reilly	2016
2.	Allen B. Downey	Think Stats: Exploratory Data Analysis in Python	Green Tea Press	2014

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19ADE23	**Python Laboratory**	L T P C 0 0 2 1

COURSE OBJECTIVES:

1. Understand the Python Programming packages Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh Language.
2. To prepare data for data analysis through understanding its distribution.
3. Exposure on data processing using NUMPY and PANDAS
4. To acquire knowledge in plotting using visualization tools.
5. To understand and implement classification and Regression Model.

COURSE OUTCOMES

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

19ADE23.CO1	Develop relevant programming abilities.
19ADE23.CO2	Demonstrate knowledge of statistical data analysis techniques
19ADE23.CO3	Exhibit proficiency to build and assess data-based models.
19ADE23.CO4	Demonstrate skill in Data management & processing tasks using Python
19ADE23.CO5	Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE23.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE23.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE23.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE23.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE23.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

LIST OF PROGRAMS

1. Working with Numpy arrays
2. Working with Pandas data frames
3. Basic plots using Matplotlib
4. Frequency distributions
5. Averages
6. Variability
7. Normal curves
8. Correlation and scatter plots
9. Correlation coefficient
10. Regression

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19ADE24 **DATA WAREHOUSING AND MINING** L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To understand data warehouse concepts, architecture, business analysis and tools
2. To understand data pre-processing and data visualization techniques
3. To study algorithms for finding hidden and interesting patterns in data
4. To understand and apply various classification and clustering techniques using tools.
5. To understand and apply suitable Learning algorithms, Clustering algorithms.

COURSE OUTCOMES

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

19ADE24.CO1 To understand and apply various classification and clustering techniques using tools.
19ADE24.CO2 Apply suitable pre-processing and visualization techniques for data analysis
19ADE24.CO3 Apply frequent pattern and association rule mining techniques for data analysis
19ADE24.CO4 Apply appropriate classification and clustering techniques for data analysis
19ADE24.CO5 Apply suitable Learning algorithms, Clustering algorithms.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE24.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE24.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE24.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE24.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE24.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP) 9

Basic Concepts - Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing -- Parallel DBMS Vendors - Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.

UNIT- II DATA MINING 9

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT- III DATA MINING - FREQUENT PATTERN ANALYSIS 9

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT- IV CLASSIFICATION AND CLUSTERING 9

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis-Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data-Clustering with constraints. Outlier analysis-outlier detection methods.

UNIT- V WEKA TOOL 9

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database - Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association--rule learners.

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Jiawei Han and Micheline Kamber	Data Mining Concepts and Techniques	Third Edition, Elsevier	2012

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Alex Berson and Stephen J.Smith	Data Warehousing, Data Mining & OLAP‖	Tata McGraw – Hill Edition, 35th Reprint	2016
2.	K.P. Soman, Shyam Diwakar and V. Ajay	Insight into Data Mining Theory and Practice‖, Eastern Economy Edition	Prentice Hall of India	2006
3.	Ian H.Witten and Eibe Frank	Data Mining: Practical Machine Learning Tools and Techniques‖	Elsevier	Second Edition

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19ADE25 **COGNITIVE SCIENCE AND ANALYTICS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To explain cognitive computing and design principles.
2. To distinguish between NLP and cognitive computing.
3. To apply advanced analytics to cognitive computing.
4. To discuss application of cognitive computing in business.
5. To illustrate various applications of cognitive computing.

COURSE OUTCOMES

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

19ADE25.CO1 Explain cognitive computing and design principles.
19ADE25.CO2 Distinguish between NLP and cognitive computing.
19ADE25.CO3 Apply advanced analytics to cognitive computing.
19ADE25.CO4 Discuss application of cognitive computing in business.
19ADE25.CO5 Illustrate various applications of cognitive computing.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE25.CO1	x	x	-	-	x	-	x	-	-	-	x	x	-	-	-
19ADE25.CO2	x	-	x	x	-	x	-	x	x	x	x	-	x	x	-
19ADE25.CO3	x	x	-	-	x	-	x	x	x	-	-	-	-	x	-
19ADE25.CO4	x	-	x	x	-	x	x	-	x	x	x	-	x	-	x
19ADE25.CO5	x	x	-	x	-	-	-	-	-	-	x	x	-	-	-

UNIT- I FOUNDATION & DESIGN PRINCIPLES 9

Foundation of Cognitive Computing: cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition.
Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into cognitive system, machine learning, hypotheses generation and scoring, presentation and visualization services.

UNIT- II NLP IN COGNITIVE SYSTEM 9

Natural Language Processing in support of a Cognitive System: Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems.
Representing knowledge in Taxonomies and Ontologies: Representing knowledge, Defining Taxonomies and Ontologies, knowledge representation, models for knowledge representation, implementation considerations.

UNIT- III BIG DATA Vs COGNITIVE COMPUTING 9

Relationship between Big Data and Cognitive Computing: Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data.
Applying Advanced Analytics to cognitive computing: Advanced analytics is on a path to cognitive computing, Key capabilities in advanced analytics, Using advanced analytics to create
value, Impact of open source tools on advanced analytics.

UNIT- IV COGNITIVE COMPUTING IN BUSINESS 9

The Business Implications of Cognitive Computing: Preparing for change, advantages of new disruptive models, knowledge meaning to business, difference with a cognitive systems approach, meshing data together differently, using business knowledge to plan for the future, answering business questions in new ways, building business specific solutions, making cognitive computing a reality, cognitive application changing the market- IBM Watson as a cognitive systems.

UNIT- V APPLICATIONS 9

The process of building a cognitive application: Emerging cognitive platform, defining the objective, defining the domain, understanding the intended users and their attributes, questions and exploring insights, training and testing- Building a cognitive health care application- Smarter cities-Cognitive Computing in Government.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Judith H Hurwitz, Marcia Kaufman, Adrian Bowles	Cognitive computing and Big Data Analytics	Wiley	2015
2.	Vijay Raghvan, Venu Govindaraju, C.R. Rao	Cognitive Computing: Theory and Applications	by Elsevier publications, North Holland Publication, 1st Edition	2016

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bernadette Sharp (Author), Florence Sedes (Author), Wieslaw Lubaszewski (Author)	Cognitive Approach to Natural Language Processing Hardcover	First Edition	2017
2.	Arun Kumar Sangaiah, Arunkumar Thangavelu, et al.,	Cognitive Computing for Big Data Systems Over IoT: Frameworks, Tools and Applications: Lecture Notes on Data Engineering and Communications Technologies	1st edition	2018
3.	Min Chen and Kai Hwang	Big-Data Analytics for Cloud, IoT and Cognitive Computing	Wiley Publication, 1st Edition	2017
4.	Mallick, Pradeep Kumar, Borah, Samarjeet	Emerging Trends and Applications in CognitiveComputing	IGI Global Publishers	2019

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19ADE26	BIG DATA ANALYTICS	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To know the fundamental concepts of big data and analytics.
2. To explore tools and practices for working with big data
3. To learn about stream computing.
4. To know about the research that requires the integration of large amounts of data.

COURSE OUTCOMES

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

19ADE26.CO1	Work with big data tools and its analysis techniques
19ADE26.CO2	Analyze data by utilizing clustering and classification algorithms
19ADE26.CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data
19ADE26.CO4	Perform analytics on data streams
19ADE26.CO5	Learn NoSQL databases and management.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE26.CO1	x	x	-	x	x	-	x	-	x	-	x	x	-	x	-
19ADE26.CO2	x	-	x	x	-	x	-	x	x	x	-	-	x	-	-
19ADE26.CO3	x	x	x	-	x	-	-	x	-	x	-	-	-	-	-
19ADE26.CO4	x	-	x	-	-	x	x	-	x	-	x	x	-	-	x
19ADE26.CO5	x	x	-	x	x	-	-	-	x	x	x	-	x	x	-

UNIT- I INTRODUCTION TO BIG DATA 9

Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage - A General Overview of High-Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model

UNIT- II CLUSTERING AND CLASSIFICATION 9

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions .- Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes' Theorem - Naïve Bayes Classifier.

UNIT- III ASSOCIATION AND RECOMMENDATION SYSTEM 9

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT- IV STREAM MEMORY 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. Using Graph Analytics for Big Data: Graph Analytics

UNIT- V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION 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 HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Anand Rajaraman and Jeffrey David Ullman	Mining of Massive Datasets	Cambridge University Press	2012
2.	David Loshin	Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph	Morgan Kaufmann/Elsevier Publishers	2013

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	EMC Education Services	"Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data	Wiley publishers	2015
2.	Bart Baesens	Analytics in a Big Data World: The Essential Guide to Data Science and its Applications	Wiley Publishers	2015
3.	Dietmar Jannach and Markus Zanker	Recommender Systems: An Introduction	Cambridge University Press	2010
4.	Kim H. Pries and Robert Dunnigan	Big Data Analytics: A Practical Guide for Managers	CRC Press	2015

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19ADE27 **BIG DATA ANALYTICS LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

1. To implement Map Reduce programs for processing big data
2. To realize storage of big data using H base, Mongo DB
3. To analyze big data using linear models
4. To analyze big data using machine learning techniques such as SVM / Decision tree

COURSE OUTCOMES

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

19ADE27.CO1 Process big data using Hadoop framework
19ADE27.CO2 Build and apply linear and logistic regression models
19ADE27.CO3 Perform data analysis with machine learning methods
19ADE27.CO4 Perform graphical data analysis
19ADE27.CO5 Process big data using Hadoop framework

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE27.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE27.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE27.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE27.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE27.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

LIST OF PROGRAMS

1. Install, configure and run Hadoop and HDFS
2. Implement word count / frequency programs using MapReduce
3. Implement an MR program that processes a weather dataset R
4. Implement Linear and logistic Regression
5. Implement SVM / Decision tree classification techniques
6. Implement clustering techniques
7. Visualize data using any plotting framework
8. Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R.

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19ADE28 **BLOCK CHAIN AND CRYPTOGRAPHY** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

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

COURSE OUTCOMES

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

19ADE28.CO1 Understand the use cases in Block Chain
19ADE28.CO2 Demonstrate the digital transaction in same and different bank.
19ADE28.CO3 Implement the Bitcoin transactions.
19ADE28.CO4 Summarizes the functions of bitcoin and make use of it to solve problems
19ADE28.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
19ADE28.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE28.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE28.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE28.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE28.CO5	x	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

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 HOURS 45

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Text Books:

S.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:

S.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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19ADE29 **PRINCIPLES OF MANAGEMENT** L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To enable the students to study the evolution of Management
2. To study the functions andprinciples of management
3. To learn the application of the principles in an organization
4. To understand the theories of leadership
5. To learn the process of controlling

COURSE OUTCOMES

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

19ADE29.CO1	Have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling
19ADE29.CO2	Have same basic knowledge on international aspect of management
19ADE29.CO3	Understand Human ResourceManagement
19ADE29.CO4	Analyze the process of communication
19ADE29.CO5	Understand System and process of controlling

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE29.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE29.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE29.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE29.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE29.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT- II PLANNING 9

Nature and purpose of planning – planning process – types of planning – COURSE OBJECTIVES – setting COURSE OBJECTIVES – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT- III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management

UNIT- IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication–communication and IT.

UNIT- V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stephen P. Robbins & Mary Coulter	Management	Prentice Hall (India) Pvt. Ltd., 10th Edition	2009
2.	JAF Stoner, Freeman R.E and Daniel R Gilbert	Management	Pearson Education, 6th Edition	2004

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stephen A. Robbins & David A. Decenzo & Mary Coulter	Fundamentals of Management	Pearson Education, 7th Edition	2011
2.	Robert Kreitner & Mamata Mohapatra	Management	Biztantra	2008
3.	Harold Koontz & Heinz Weihrich	Essentials of management	Tata McGraw Hill	1998
4.	Tripathy PC & Reddy PN	Principles of Management	Tata McGraw Hill	1999

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19ADE30	IOT SYSTEM AND ANALYTICS	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To understand Smart Objects and IoT Architectures
2. To learn about various IOT-related protocols
3. To build simple IoT Systems using Arduino and Raspberry Pi.
4. To understand data analytics and cloud in the context of IoT
5. To develop IoT infrastructure for popular applications

COURSE OUTCOMES

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

19ADE30.CO1 Explain the concept of IoT.
19ADE30.CO2 Analyze various protocols for IoT.
19ADE30.CO3 Design a PoC of an IoT system using Rasperry Pi/Arduino
19ADE30.CO4 Apply data analytics and use cloud offerings related to IoT.
19ADE30.CO5 Analyze applications of IoT in real time scenario

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE30.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE30.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE30.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE30.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE30.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I FUNDAMENTALS OF IoT 9

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack — Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT- II IoT PROTOCOLS 9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT- III DESIGN AND DEVELOPMENT 9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT- IV DATA ANALYTICS AND SUPPORTING SERVICES 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

UNIT- V CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

TOTAL HOURS 45

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Text Books:

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

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Olivier Hersent, David Boswarthick, Omar Elloumi	The Internet of Things – Key applications and Protocols	Wiley	2012
2.	Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle	From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence	Elsevier	2014
3.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds)	Architecting the Internet of Things	Springer	2011

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19ADE31 **IOT SYSTEM AND ANALYTICS LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

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

COURSE OUTCOMES

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

19ADE31.CO1 Execute Assembly Language experiments using simulator
19ADE31.CO2 Implement ALU operations
19ADE31.CO3 Design waveforms and test timers.
19ADE31.CO4 Develop real time applications and explore ARM/PIC using Embedded C.
19ADE31.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
19ADE31.CO1	x	x	-	-	-	x	-	-	x	-	-	x	-	x	-
19ADE31.CO2	x	-	x	x	-	x	x	x	x	x	x	-	-	-	x
19ADE31.CO3	x	x	-	-	x	-	-	x	-	x	-	-	x	-	-
19ADE31.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE31.CO5	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.

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19ADE32 **BIO-INSPIRED OPTIMIZATION TECHNIQUES** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To understand fundamental topics in bio-inspired optimization techniques
2. To Learn the collective systems such as ACO, PSO, and BCO
3. To develop skills in biologically inspired algorithm design with an emphasis on solving real world problems
4. To understand the most appropriate types of algorithms for different data analysis problems and to introduce some of the most appropriate implementation strategies.
5. To implement the Bio-inspired technique with other traditional algorithms.

COURSE OUTCOMES

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

19ADE32.CO1	Familiarity with the basics of several biologically inspired optimization techniques.
19ADE32.CO2	Familiarity with the basics of several biologically inspired computing paradigms.
19ADE32.CO3	Ability to select an appropriate bio-inspired computing method and implementfor any application and data set.
19ADE32.CO4	Theoretical understanding of the differences between the major bio-inspired computing methods.
19ADE32.CO5	Learn Other Swarm Intelligence algorithms and implement the Bio-inspired technique with other traditional algorithms.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE32.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE32.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE32.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE32.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE32.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I INTRODUCTION 9

Optimization Techniques: Introduction to Optimization Problems – Single and Muti- objective Optimization – Classical Techniques – Overview of various Optimization methods – Evolutionary Computing: Genetic Algorithm and Genetic Programming: Basic concept – encoding – representation – fitness function – Reproduction – differences between GA and Traditional optimization methods – Applications – Bio- inspired Computing (BIC): Motivation – Overview of BIC – usage of BIC – merits and demerits of BIC.

UNIT- II SWARM INTELLIGENCE 9

Introduction – Biological foundations of Swarm Intelligence – Swarm Intelligence in Optimization – Ant Colonies: Ant Foraging Behavior – Towards ArtificialAnts – Ant Colony Optimization (ACO) – S-ACO – Ant Colony Optimization Metaheuristic: Combinatorial Optimization – ACO Metaheuristic – Problem solving usingACO – Other Metaheuristics – Simulated annealing – Tabu Search – Local search methods – Scope of ACO algorithms.

UNIT- III NATURAL TO ARTIFICIAL SYSTEMS 9

Biological Nervous Systems – artificial neural networks – architecture – Learning Paradigms – unsupervised learning – supervised learning – reinforcement learning – evolution of neural networks – hybrid neural systems – Biological Inspirations in problem solving – Behavior of Social Insects: Foraging –Division of Labor – Task Allocation – Cemetery Organization and Brood Sorting – Nest Building – Cooperative transport.

UNIT- IV SWARM ROBOTICS 9

Foraging for food – Clustering of objects – Collective Prey retrieval –Scope of Swarm Robotics – Social Adaptation of Knowledge: Particle Swarm – ParticleSwarm Optimization (PSO) – Particle Swarms for Dynamic Optimization Problems – Artificial Bee Colony (ABC) Optimization biologically inspired algorithms in engineering.

UNIT- V CASE STUDIES 9

Other Swarm Intelligence algorithms: Fish Swarm – Bacteria foraging – Intelligent Water Drop Algorithms – Applications of biologically inspired algorithms in engineering. Case Studies: ACO and PSO for NP-hard problems – Routing problems – Assignment problems – Scheduling problems – Subset problems – Machine Learning Problems –Travelling Salesmanproblem.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	A. E. Elben and J. E. Smith	Introduction to Evolutionary Computing	Springer	2010
2.	Floreano D. and Mattiussi C	Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies	MIT Press, Cambridge, MA	2008

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Eric Bonabeau, Marco Dorigo, Guy Theraulaz	Swarm Intelligence: From Natural to Artificial Systems	Oxford University press	2000
2.	Christian Blum, Daniel Merkle (Eds.)	Swarm Intelligence: Introduction and Applications	Springer Verlag	2008
3.	Leandro N De Castro, Fernando J Von Zuben	Recent Developments in Biologically Inspired Computing	Idea Group Inc	2005
4.	Albert Y.Zomaya	Handbook of Nature-Inspired and Innovative Computing	Springer	2006
5.	C. Ebelhart et al	Swarm Intelligence	Morgan Kaufmann	2001

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19ADE33 **INFORMATION EXTRACTION AND RETRIEVAL** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

1. To understand the different ways for extraction of multimedia data
2. To learn and analyze the information retrieval techniques
3. To apply the information retrieval algorithms for real time applications
4. To understand and evaluate the applications of information retrieval techniques
5. To understand the role of information retrieval systems in web applications

COURSE OUTCOMES

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

19ADE33.CO1 Able to apply the information extraction techniques for real time applications
19ADE33.CO2 Design systems based on the concepts of information retrieval
19ADE33.CO3 Apply data specific information extraction and retrieval
19ADE33.CO4 Create web applications by understanding the information extraction and retrieval techniques
19ADE33.CO5 Use the concepts of information classification and clustering in wide range of other applications

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE33.CO1	x	x	-	x	x	-	x	-	x	-	x	x	x	x	-
19ADE33.CO2	x	-	x	x	-	x	-	x	-	x	x	-	-	-	-
19ADE33.CO3	x	-	-	-	x	-	-	x	-	x	-	-	-	-	-
19ADE33.CO4	x	x	x	-	x	x	x	-	x	x	x	-	x	-	x
19ADE33.CO5	x	x	-	x	-	-	-	-	x	-	x	x	-	x	-

UNIT- I INTRODUCTION TO INFORMATION EXTRACTION 9

Introduction – Origins – Text, Audio ,Image, Video Extraction – Visual object Feature Localization - Entropy based Image Analysis – 3D shape Extraction Techniques - Semantic Multimedia Extraction using Audio & Video – Multimedia Web Documents.

UNIT- II TEXT EXTRACTION 9

Pre-processing Techniques – Clustering – Probabilistic Models – Browsing and Query Refinement on presentation Layer- Link Analysis – Visualization Approaches and its Operations.

UNIT- III INFORMATION RETRIEVAL SYSTEMS 9

Text formats –Retrieval and Ranking –Evaluation strategies – Tokens –Query processing –Static Inverted Indices – Dynamic Inverted Indices – Index compression –Categorization and Filtering Classifiers –Probabilistic, Linear ,Similarity based, Generalized Linear, Information Theoretic
models- XML Retrieval.

UNIT- IV ALGORITHMS ON INFORMATION RETRIEVAL 9

Introduction – Strategies - Utilities – Crossing the language barrier- Cross Language strategies with Utilities – Efficiency Multidimensional data model- Parallel Information Retrieval – Distributed Information Retrieval.

UNIT- V APPLICATIONS 9

Sound Authoring Data with Audio MME-CBR Systems-Implementation of Message Recognition Systems – Paralinguistic Information Retrieval in Broadcast – Text mining Applications- Pre- processing Applications using Probabilistic and Hybrid Approaches – Web Search.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mark T. Maybury	Multimedia Information Extraction	Wiley (IEEE), John Wiley & Sons	2012
2.	Ronen Feldman, James Sanger	Text Mining Handbook	Cambridge University press	2006

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David A. Grossman, Ophir Frieder	Information Retrieval: Algorithms and Heuristics	Second Edition, Springer	2004
2.	Stefan Buttcher LA Clarke Gox v.Cormack	Information Retrieval: Implementing and Evaluating Search Engines	MIT Press	2016

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19ADE34	DATA SECURITY AND PRIVACY	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To understand the fundamentals of security, and how it relates to information systems.
2. To identify risks and vulnerabilities in operating systems from a database perspective.
3. To learn good password policies, and techniques to secure passwords in an organization.
4. To learn and implement administration policies for users.
5. To understand the various database security models and their advantages or disadvantages.

COURSE OUTCOMES

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

19ADE34.CO1 Relates the fundamentals of security to information systems
19ADE34.CO2 Identify risks and vulnerabilities in operating systems
19ADE34.CO3 Analyze the techniques to secure passwords in an organization
19ADE34.CO4 Implement administration policies for users.
19ADE34.CO5 Implement privacy preserving data mining algorithms.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE34.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE34.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE34.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE34.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE34.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I SECURITY ARCHITECTURE & OPERATING SYSTEM SECURITY FUNDAMENTALS 9

Security Architecture: Introduction-Information Systems- Database Management Systems-Information Security Architecture- Database Security–Asset Types and value-Security Methods.Operating System Security Fundamentals: Introduction-Operating System Overview-Security Environment – Components- Authentication Methods-User Administration-Password PoliciesVulnerabilities-E-mail Security.

UNIT- II ADMINISTRATION OF USERS & PROFILES,PASSWORD POLICIES, PRIVILEGES AND ROLES 9

Administration of Users: Introduction-Authentication-Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Best Practices Profiles, Password Policies, Privileges and Roles: Introduction-Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles-Best Practices

UNIT- III DATABASE APPLICATION SECURITY MODELS & VIRTUAL PRIVATE DATABASES 9

Database Application Security Models: Introduction-Types of Users-Security Models- Application Types-Application Security Models-Data Encryption Virtual Private Databases: Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager Implementing Row and Column level Security with SQL Server

UNIT- IV AUDITING DATABASE ACTIVITIES 9

Auditing Database Activities: Using Oracle Database Activities-Creating DLL Triggers with OracleAuditing Database Activities with Oracle-Auditing Server Activity with SQL Server 2000-Security and Auditing Project Case Study.

UNIT- V PRIVACY PRESERVING DATA MINING TECHNIQUES 9

Privacy Preserving Data Mining Techniques: Introduction- Privacy Preserving Data Mining AlgorithmsGeneral Survey-Randomization Methods-Group Based Anonymization-Distributed Privacy Preserving Data Mining-Curse of Dimensionality-Application of Privacy Preserving Data Mining

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hassan A. Afyouni	Database Security and Auditing	Third Edition, Cengage Learning	2009
2.	Charu C. Aggarwal, Philip S Yu	Privacy Preserving Data Mining	Models and Algorithms, Kluwer Academic Publishers	2008

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ron Ben Natan	Implementing Database Security and Auditing	Elsevier Digital Press	2005

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19ADE35 **ADHOC AND SENSOR NETWORKS** L T P C
3 0 0 3

COURSE OBJECTIVES:

1. Understand the design issues in ad hoc and sensor networks.
2. Learn the different types of MAC protocols.
3. Be familiar with different types of adhoc routing protocols.
4. Be expose to the TCP issues in adhoc networks.
5. Learn the architecture and protocols of wireless sensor networks.

COURSE OUTCOMES

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

19ADE35.CO1	Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks
19ADE35.CO2	Analyze the protocol design issues of ad hoc and sensor networks
19ADE35.CO3	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
19ADE35.CO4	Evaluate the QoS related performance measurements of ad hoc and sensor networks
19ADE35.CO5	Understand the architecture and protocols of wireless sensor networks

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE35.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE35.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE35.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE35.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE35.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I INTRODUCTION 9

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) :concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT- II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS 9

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols-Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT- III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS 9

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT- IV WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS 9

Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

UNIT- V WSN ROUTING, LOCALIZATION & QOS 9

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

TOTAL HOURS 45

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Text Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	C. Siva Ram Murthy, and B. S. Manoj	Ad Hoc Wireless Networks: Architectures and Protocols	Prentice Hall Professional Technical Reference	2008

Reference Books:				
S.No.	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Carlos De Morais Cordeiro, Dharma Prakash Agrawal	Ad Hoc & Sensor Networks: Theory and Applications	World Scientific Publishing Company	2006
2.	Feng Zhao and Leonides Guibas	Wireless Sensor Networks	Elsevier Publication	2002
3.	Holger Karl and Andreas Willig	Protocols and Architectures for Wireless Sensor Networks	Wiley	2005
4.	Anna Hac	Wireless Sensor Network Designs	John Wiley	2003

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19ADE36 **DIGITAL IMAGE PROCESSING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To become familiar with digital image fundamentals
2. To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
3. To learn concepts of degradation function and restoration techniques.
4. To study the image segmentation and representation techniques.
5. To become familiar with image compression and recognition methods

COURSE OUTCOMES

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

19ADE36.CO1 Know and understand the basics and fundamentals of digital image processing
19ADE36.CO2 Operate on images using the techniques of smoothing, sharpening and enhancement.
19ADE36.CO3 Understand the restoration concepts and filtering techniques.
19ADE36.CO4 Learn the basics of segmentation, features extraction
19ADE36.CO5 Understand the compression and recognition methods for color models.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADE36.CO1	x	-	-	-	x	x	x	-	x	-	x	x	x	-	-
19ADE36.CO2	x	-	x	x	-	x	-	x	x	x	-	-	-	-	x
19ADE36.CO3	x	x	-	-	x	-	-	x	-	x	-	-	-	x	-
19ADE36.CO4	x	-	x	-	-	x	x	-	x	x	x	-	-	-	-
19ADE36.CO5	x	x	-	x	-	-	-	-	x	-	x	x	x	x	-

UNIT- I DIGITAL IMAGE FUNDAMENTALS 9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT- II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT- III IMAGE RESTORATION 9

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT- IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT- V IMAGE COMPRESSION AND RECOGNITION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL HOURS 45

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Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rafael C. Gonzalez, Richard E. Woods	Digital Image Processing	Pearson, Third Edition	2010
2.	Anil K. Jain	Fundamentals of Digital Image Processing	Pearson	2002

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kenneth R. Castleman	Digital Image Processing	Pearson	2006
2.	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins	Digital Image Processing using MATLAB	Pearson Education, Inc.	2011
3.	D.E. Dudgeon and RM. Mersereau	Multidimensional Digital Signal Processing	Prentice Hall Professional Technical Reference	1990
4.	William K. Pratt	Digital Image Processing	John Wiley, New York	2002

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19ADP05 **ENTREPRENEURSHIP DEVELOPMENT** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To promote strong entrepreneurship among Engineers, Managers and Science students.
- To promote entrepreneurship among relevant sectors in the state.
- To collaborate with other organizations and institutions.
- To organize entrepreneurship development and awareness programs.
- To develop close links between industry-Institute by interaction programs. High priority to activities designedto bring about improvement in the performance of the industry.

COURSE OUTCOMES:

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

19ADP05.CO1	Identifying real problems and a solutions people want Pitching solutions, such as products and services.
19ADP05.CO2	Developing and managing early stage software.
19ADP05.CO3	Achieve high degree of productivity in a small team via agile, high quality practices and teamorganization approaches
19ADP05.CO4	Create a production software development environment.
19ADP05.CO5	Achieve customer satisfaction in the development of IT products and services

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADP05.C01	x	-	x	x	-	-	-	-	-	x	-	x	x	x	-
19ADP05.C02	x	x	-	-	x	-	-	x	x	x	-	-	x	-	-
19ADP05.C03	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-
19ADP05.C04	x	x	x	x	-	x	-	-	x	x	x	-	x	-	x
19ADP05.C05	x	x	x	x	-	x	-	-	x	x	x	x	x	x	-

UNIT I CONCEPT OF ENTREPRENEURSHIP: 9

Meaning and characteristics of entrepreneurship, entrepreneurial culture, socio-economic origin of entrepreneurship, factors affecting entrepreneurship, conceptual model of entrepreneurship, traits of a good entrepreneur, entrepreneur, intra-preneur and manager ENTREPRENEURIAL MOTIVATION: motivating, compelling and facilitating factors, entrepreneurial ambition, achievement motivation theory and Kakinada experiment.

UNIT II ESTABLISHMENT OF ENTREPRENEURIAL SYSTEMS 9

Search, processing and selection of idea, Input requirements SMALL SCALE INDUSTRY: meaning, importance, characteristics, advantages and problems of SSIs. Steps for starting a small industry, guidelines for project report registration as SSI.

UNIT III ASSISTANCE TO SSI 9

need for incentives & subsidies, need for institutional support, role of government and other institutions

UNIT IV FUNCTIONAL PLANS 9

Marketing plan- marketing research for the new venture, steps in preparing marketing plan, contingency planning; Organizational plan- Forms of ownership, designing organizational structure, job design, manpower planning; Financial plan- cash budget, working capital, proforma income statement, Proforma cash flow, proforma balance sheet, break even analysis.

UNIT V SOURCES OF FINANCE 9

Debt or Equity financing, commercial banks, venture capital; financial institutions supporting entrepreneurs; legal issues- intellectual property rights, patents, trademarks, copy rights, trade secrets, licensing franchising.

TOTAL: 45

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gupta C. B. and Srinivasan N. P	Entrepreneurial Development	Sultan Chand & Sons	2014
2.	Vasant Desai	Management of a Small Scale Industry	Himalaya Publishing House	2011

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Sangeetha Sharma	Entrepreneurship Development	PHI Learning Pvt. Ltd	2016
2	K Ramachandran	Entrepreneurship Development	Tata McGraw-Hill	2009
3	Abhishek Nirjar	Entrepreneurship Development	CBS Publishers	2014
4	S. Anil Kumar	Entrepreneurship Development	New Age International	2008
5	Fang Zhao	Information Technology Entrepreneurship and Innovation	O'Reilly	2008

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19ADP06 **PROFESSIONAL PRACTICES** **L T P C**
0 0 6 3

COURSE OBJECTIVES

- To examine important professional issues in contemporary practice and
- To help students become an effective participant in a team of IT professionals.
- To have gained a thorough understanding of the various issues/factors and IT professional faces and how oneshould respond.
- To have learned what are considered professional behavior in the IT field
- To have learned about the current IT practices.

COURSE OUTCOMES:

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

19ADP06.CO1 Describe the various issues/factors an information technology professional
19ADP06.CO2 Describe professional behavior in the information technology.
19ADP06.CO3 Recognize what are the current issues in IT and the emerging technology
19ADP06.CO4 Write properly formatted and organized technical reports
19ADP06.CO5 Develop professional attitude from the perspectives of experienced IT practitioners

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADP06.C01	x	-	x	x	-	x	-	-	-	x	-	x	-	x	-
19ADP06.C02	x	x	-	-	-	-	-	x	x	x	-	-	x	x	x
19ADP06.C03	x	-	x	x	-	x	x	-	x	x	x	x	-	x	x
19ADP06.C04	x	x	x	x	-	x	-	-	x	x	x	-	x	-	x
19ADP06.C05	x	x	x	x	-	x	x	-	x	x	x	x	-	x	-

CONTENT

1. Discipline-specific knowledge and capabilities: appropriate to the level of study related to an InformationTechnology profession.
2. Communication: using oral, written and interpersonal communication to inform, motivate and effect change
3. Digital literacy: using technologies to find, use and disseminate information
4. Critical thinking: evaluating information using critical and analytical thinking and judgment
5. Problem solving: creating solutions to authentic (real world and ill-defined) problems
6. Self-management: working and learning independently, and taking responsibility for personal actions.
7. Teamwork: working and learning with others from different disciplines and backgrounds
8. Global citizenship: engaging ethically and productively in the professional context and with diverse communitiesand cultures in a global context

I **Information Technology Professionalism**
- A. Privacy and confidentiality
- B. Computer ethics
- C. Intellectual property issues
- D. Computer crime and fraud
- E. Professional bodies
- F. Impact of information technology on society

II **Information Technology Practices**
- A. Effects of standardization
- B. Effectiveness vs efficiency
- C. Distributed systems issues
- D. Emerging technologies
- E. Quality issues
- F. Current issues

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Schultz, Robert A	Contemporary Issues inEthics and Information Technology	IRM Press	2006
2.	Baase S	A Gift of Fire, Social, Legaland Ethical Issues for Computers and the Internet	Prentice Hall	2003

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Johnson DG	Computer Ethics	Prentice Hall	2001
2.	Spinello RA	CyberEthics: Morality and Law in Cyberspace	Jones and Bartlett	2000

WEB URLs

1. www.infosec.gov.hk
2. www.pcpd.org.hk
3. www.ipd.gov.hk
4. www.ogcio.gov.hk
5. www.hkcs.org.hk

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19ADP01 **PROJECT WORK PHASE I** **L T P C**
0 0 6 3

COURSE OBJECTIVES

1. The practical implementation of theoretical knowledge gained during the study from First year to Third year
2. The student should be able implement their ideas/real time industrial problem/ current application of their engineering branch which they have studied in curriculum
3. To build confidence in the student what he has learnt theoretically
4. Describe the problem statement
5. Analyze and process the experimental information

COURSE OUTCOMES:

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

19ADP01.CO1 Understand the technical concepts of project area.
19ADP01.CO2 Identify the problem and formulation
19ADP01.CO3 Design the problem statement
19ADP01.CO4 Formulate the algorithms by using the design
19ADP01.CO5 Develop the module

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADP01.CO1	x	x	x	-	x	x	-	-	-	x	-	x	x	-	x
19ADP01.CO2	x	x	-	-	x	-	-	x	-	-	x	-	-	x	-
19ADP01.CO3	x	x	-	x	-	x	-	-	-	-	x	x	-	-	x
19ADP01.CO4	x	-	x	-	-	-	x	-	x	-	-	-	x	x	-
19ADP01.CO5	x	x	-	x	x	-	-	x	x	x	x	x	x	-	x

CONTENT

1. Project helped students to gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal.
2. B.E. Projects can be two types: Projects based on implementation of any application oriented problem, which will be more or less experimental in nature, and the others will be based on some innovative/ theoretical work.
3. In Project Phase-I the student will undertake project over the academic year, which will involve the analysis, design of a system or sub system in the area identified earlier in the field of Information Technology.
4. The topic must be formulated in consultation with the guide and project coordinator
5. The project will be undertaken preferably by a group of 1-3 students who will jointly work and implement the project.
6. The group will select a project with approval from a committee formed by the department of senior faculty to check the feasibility and approve the topic.

REVIEW COMMITTEE

1. The Head of the department/Project coordinator shall constitute a review committee for project work for project group
2. Project guide would be one member of that committee by default
3. The students or project group shall make presentation on the progress made by them before the committee.
4. The record of the remarks/suggestions of the review committee should be properly maintained and should be made available at the time of examination
5. Each student/group is required to give presentation as part of review for 10 to 15 minutes followed by a detailed discussion.

PROJECT WORK REVIEWS

1. Project work phases will have a minimum of three internal reviews by an appointed committee of faculty.
2. The final review will be done by an external faculty

Review 1: Finalization of scope - the objectives and scope of the project should be finalized in second week of their academic semester. Should finalize list of required hardware, software or other equipment for executing the project, test environment/tools

Review 2: Finalization - High level design, planning

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Guidelines for Students and Faculty:

PROJECT REVIEW COMMITTEE

1. This committee will be responsible for evaluating the timely progress of the projects and communicating the progress report to the students.
2. As far as possible Students should finalize the same project title taken for Project.
3. Review committee should conduct "Feasibility Review" in first week after commencement of the term.
4. Review Committee should finalize the scope of the project.
5. If change in project topic is unavoidable then the students should complete the process of project approval by submitting synopsis along with the review of important papers. This new project topic should be approved by review committee

TERM WORK

1. The term work will consist of a report prepared by the student on the project allotted to them
2. They should use appropriate tools for the preparation of the report like project planning, UML diagram, testing tools, referencing tools etc.

REPORT STRUCTURE

- Contents
- List of Abbreviations
- List of Figures
- List of Graphs
- List of TableS
  1. Introduction and aims/motivation and objectives
  2. Literature Survey
  3. Problem Statement
  4. Project Requirements
  5. System Analysis Proposed Architecture/ high level design of the project
  6. Verification Validation
  7. Project Plan 8. Conclusion

References
Appendices
Base Paper(s)

EVALUATION GUIDELINES

A panel of examiner will evaluate the viability of project / project scope.

The panel will also verify that all the suggestions/comments in the review document are taken care and accordingly allot the term work marks.
Oral examination in the form of presentation will be based on the project work completed by the candidates. Preliminary report must also be presented during the oral examination.

TOTAL :90

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19ADP02	PROJECT WORK - PHASE II	L	T	P	C
		0	0	15	12

COURSE OBJECTIVES

1. Plan an experimental design to solve Engineering problems
2. Develop an attitude of team work and independent working on real time problems
3. Analyze and process the experimental information
4. Evaluate, interpret and justify the experimental results
5. Develop a dissertation report

COURSE OUTCOMES:

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

19ADP02.CO1 Design an experiment to solve engineering / societal problems using modern tools
19ADP02.CO2 Develop lifelong learning to keep abreast of latest technologies.
19ADP02.CO3 Implement the workflow to provide sustainable solutions
19ADP02.CO4 Interpret the experimental results and the impact on society and environment
19ADP02.CO5 Investigate the application for the real time problems

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADP02.CO1	x	x	x	x	x	-	-	-	x	-	-	-	x	x	x
19ADP02.CO2	x	x	x	-	x	x	-	x		-	x	x	x	x	-
19ADP02.CO3	x	x	x	x	x	-	-	-	x	-	x	-	x	-	x
19ADP02.CO4	x	x	x	x	-	x	x	x	-	x	x	x	x		-
19ADP02.CO5	x	x	x	-	-	-	x	x	x	x	-	x	-	x	x

PROJECT WORK REVIEWS

- Project work phases will have a minimum of three internal reviews by an appointed committee of faculty.
- The final review will be done by an external faculty

Review 3: Implementation Status and testing document
Review 4: Final Project Demonstration, Project Report and proper Result analysis

The group will submit at the end of semester II.

1. The Workable project.

2. Project report (Word Document) in the form of bound journal complete in all respect – 1 copy for the Institute, 1 copy for guide and 1 copy of each student in the group for certification.

The project report contains the details:

1. Problem definition

2. Requirement specification

   System design details (UML diagrams)

   System implementation – code documentation – dataflow diagrams/ algorithm, protocols used

   Test result and procedure

   Conclusions.

   Appendix

   a.Tools used
   b. References
   c. Papers published/certificates

TOTAL: 360

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19ADP03 **COMPREHENSION** **L T P C**
0 0 4 2

COURSE OBJECTIVES

- To write effective and coherent paragraphs
- To comprehend the overall and internal organization of an academic essay
- To write an effective thesis statement
- To understand vocabulary
- To use pre-writing strategies to plan writing.

COURSE OUTCOMES:

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

19ADP03.CO1	Write a paragraph with a topic sentence, support, and concluding sentence
19ADP03.CO2	Produce coherent and unified paragraphs with adequate support and detail of the topic
19ADP03.CO3	Write an effective introduction thesis statement that addresses the writing prompt and conclusion
19ADP03.CO4	Produce appropriate vocabulary and correct word forms
19ADP03.CO5	Produce accurate grammatical structures for the paragraph writing.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADP03.CO1	x	-	-	-	x	x	x	x	x	x	-	x	-	x	-
19ADP03.CO1	x	-	-	-	-	x	-	x	x	x	-	x	-	-	x
19ADP03.CO1	x	x	x	x	x	x	-	-	x	x	x	x	-	x	-
19ADP03.CO1	x	-	-	-	-	x	-	-	x	x	x	x	x	-	x
19ADP03.CO1	x	-	-	-	x	x	-	-	x	x	x	x	x	x	-

COMPREHENSION TOPICS

1. Cloud Computing for Small Businesses
2. Role of Information Technology in Corporate Functions
3. Knowledge Management
4. The Impact of Cloud Computing
5. Cluster computing
6. Computer Forensics
7. The Internet of Things
8. Data Security
9. Green Computing
10. Issue on eGovernment Development and Applications
11. Big Data
12. Design of Reversible Computing Systems
13. Social Platforms

TOTAL :60

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19ADP04	TECHNICAL SEMINAR	L	T	P	C
		0	4	0	2

COURSE OBJECTIVES

- To develop Communication and Presentation skill
- To expose students to the 'real' working environment and get acquainted with the organization structure
- To develop the business operations and administrative functions
- To promote and develop presentation skills and import a knowledgeable society
- To set the stage for future recruitment by potential employers

COURSE OUTCOMES:

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

19ADP04.CO1	Develop a skill for work in actual working environment.
19ADP04.CO2	Utilize available technical resources in efficient manner
19ADP04.CO3	Write technical documents and give oral presentations related to the work completed
19ADP04.CO4	Prepare a presentation in latest trends in Information Technology
19ADP04.CO5	Implement the presentation in latest trends in Information Technology

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19ADP04.C01	x	-	x	-	-	x	x	-	-	-	-	-	x	-	-
19ADP04.C02	-	-	x	-	x	-	-	x	x	x	-	-	-	-	x
19ADP04.C03	x	-	x	-	x	-	-	-	-	x	x	-	-	x	-
19ADP04.C04	-	-	x	x	x	-	-	-	x	-	x	-	x	x	-
19ADP04.C05	x	-	x	-	x	x	-	-	x	-	-	x	x	x	x

Seminar Topic:

1. Seminar topic should relate to the Information Technology, Some of the seminar topics are listed below:
2. FreeNet
3. Linear Programming in Cloud
4. Blackberry Technology
5. Biometric Security Systems
6. Credit Card Fraud Detection
7. Vehicle Management System
8. Smartshader Technology
9. Digital Piracy
10. Google Glass
11. Data Recover
12. Cyber and Social Terrorism
13. Space Mouse
14. Pill Camera
15. Ambient Intelligence
16. Mind Reading Computer
17. Honeypots
18. Security through Obscurity
19. Electronic Banking
20. Gi-Fi

SCHEME OF EVALUATION

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I.

The Course is evaluated based on:

- Presentation
- Student's reports
- PPT presentation
- Presentation will take place in the weekly class. The presentation is evaluation by your class in charge
- Report must be submitted during presentation. The report evaluation is done by your class in charge.
- A Viva voce comprising comprehensive questions based on the presentation

TOTAL :60

Chairman
Board of Studies
Department of Computer Science and Engineering
MUTHAYAMMAL ENGINEERING COLLEGE
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