Er. PERUMAL MANIMEKALAI COLLEGE OF ENGINEERING

(An Autonomous Institution – Affiliated to Anna University, Chennai)

Koneripalli, Hosur – 635117.

PMC TECH

INSPIRE TO INNOVATE

ACADEMIC REGULATIONS 2023 (R23)

Curriculum & Syllabi

(Version 1)

MCA Degree Programme

Master of Computer Applications

Applicable from 2023 -24 onwards

AUTONOMOUS AFFILIATED COLLEGE

REGULATIONS 2023

CHOICE BASED CREDIT SYSTEM

MASTER OF COMPUTER APPLICATIONS

CURRICULUM AND SYLLABI FOR I TO IV SEMESTERS

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1 : Apply their computing skills to analyse, design and develop innovative software products to meet the industry needs and excel as software professionals.

PEO2 : Communicate and function effectively in teams in multidisciplinary fields within the global, societal and environmental context.

PEO3 : Exhibit professional integrity, ethics, life long learning with responsibility to contribute technical solutions for the sustainable development of society.

PROGRAMME OUTCOMES (POs):

PO1 : An ability to independently carry out research/investigation and development work to solve practical problems

PO2 : An ability to write and present a substantial technical report/document

PO3 : Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program

PO4 : Able to select suitable data models, appropriate architecture, and platform to implement a system with good performance.

PO5 : Able to design and integrate various system based components to provide user interactive solutions for various challenges.

PO6 : Able to develop applications for real time environments using existing and upcoming technologies.

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PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1 : Able to understand and apply knowledge on analysis, design and development of software applications.

PSO2 : Able to work with modern software tools and technique

PSO3 : Able to match their skills for employment and advanced studies with continuous learning, creative thinking, flexibility in taking responsibility, consistency in performance

PEO/PO/PSO MAPPING

PEO / PO / PSO MAPPING									
PEOs	POs						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
PEO1	3	3	3	3	3	3	3	3	3
PEO2	3	2	2	1	2	2	1	2	3
PEO3	3	2	3	2	2	2	2	3	3

PMC TECH
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ACCREDITED BY NBA & NAAC WITH 'A' GRADE
Koneripalli, HOSUR - 635 117.

AUTONOMOUS AFFILIATED COLLEGE

REGULATIONS 2023

CHOICE BASED CREDIT SYSTEM

MASTER OF COMPUTER APPLICATIONS

CURRICULUM AND SYLLABI FOR I TO IV SEMESTERS

SEMESTER I

S.NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	PPMC1FC01	Applied Probability and Statistics for Computer Science Engineers	FC	3	1	-	4	4
2	PPMC1PC01	Advanced Data Structures and Algorithms	PC	3	-	-	3	3
3	PPMC1PC02	Object Oriented Software Engineering	PC	3	-	-	3	3
4	PPMC1PC03	Python Programming	PC	3	-	-	3	3
5	PPMC1PC04	Cloud Computing Technologies	PC	3	-	-	3	3
6	PPMC1PC05	Java Programming	PC	3	-	2	5	4
7	PPMC1AC01	Audit Course – I*	AC	2	-	-	2	0
PRACTICALS								
8	PPMC1PL01	Advanced Data Structures and Algorithms Laboratory	PL	-	-	4	4	2
9	PPMC1PL02	Python Programming Laboratory	PL	-	-	4	4	2
10	PPMC1PD01	Communication Skills – I	PD	-	-	2	2	1
		Total						25

*Audit course is optional

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SEMESTER II

S.NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	PPMC2PC06	Full Stack Web Development	PC	3	-	-	3	3
2	PPMC2PC07	Machine Learning	PC	3	-	-	3	3
3	PPMC2PC08	Advanced Database Technology	PC	3	0	2	5	4
4	PPMC2PC09	Mobile Application Development	PC	3	0	2	5	4
5	PPMC2PEXX	Professional Elective I	PE	3	-	-	3	3
6	PPMC2PEXX	Professional Elective II	PE	3	-	-	3	3
7	PPMC2ILXX	Industry Lecture**	IL	2	-	-	2	0
8	PPMC2ACXX	Audit Course – II*	AC	2	-	-	2	0
PRACTICALS								
8	PPMC2PL02	Full Stack Web Development Laboratory	PL	-	-	4	4	2
9	PPMC2PL03	Machine Learning Laboratory	PL	-	-	4	4	2
10	PPMC2PD02	Communication Skills – II	PD	0	0	2	2	1
Total								25

*Audit course is optional
**Industry Lecture is Mandatory

SEMESTER III

S.NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	PPMC3PC10	AI for Data Science	PC	3	-	-	3	3
2.	PPMC3PC11	Internet of Things	PC	3	-	-	3	3
3.	PPMC3PC12	Software Quality and Testing	PC	3	0	2	5	4
4.	PPMC3PEXX	Professional Elective III	PE	3	-	-	3	3
5.	PPMC3PEXX	Professional Elective IV	PE	3	-	-	3	3
6.	PPMC3OC01	Open Elective	OE	3	-	-	3	3
PRACTICALS								
7.	PPMC3PL05	Data Science Laboratory	PL	-	-	4	4	2
8.	PPMC3PL06	Internet of Things Laboratory	PL	-	-	4	4	2
9.	PPMC3PR01	Mini Project	PR	0	0	2	2	1
Total								24

SEMESTER IV

S.NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	PPMC4PR02	Project	PR	-	-	12	12	12

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PROFESSIONAL ELECTIVES – I & II

SEMESTER II

S.No.	COURSE CODE	COURSE TITLE	CATE - GORY	CONTACT PERIODS	L	T	P	C
1.	PPMC2PE01	Software Project Management	PE	3	3	0	0	3
2.	PPMC2PE02	Professional Ethics in IT	PE	3	3	0	0	3
3.	PPMC2PE03	Advances in Operating System	PE	3	3	0	0	3
4.	PPMC2PE04	Information Retrieval Techniques	PE	3	3	0		0
5.	PPMC2PE05	Wireless Networking	PE	3	3	0	0	3
6.	PPMC2PE06	Soft Computing Techniques	PE	3	3	0	0	3
7.	PPMC2PE07	Cyber Security	PE	3	3	0	0	3
8.	PPMC2PE08	Digital Image Processing	PE	3	3	0	0	3
9.	PPMC2PE09	Data Mining and Data Warehousing Techniques	PE	3	3	0	0	3
10.	PPMC2PE10	Software Architecture	PE	3	3	0	0	3
11.	PPMC2PE11	Agile Methodologies	PE	3	3	0	0	3

PROFESSIONAL ELECTIVES – III & IV

SEMESTER III

S.No.	COURSE CODE	COURSE TITLE	CATE - GORY	CONTACT PERIODS	L	T	P	C
1.	PPMC3PE01	Exploratory Data Analysis	PE	3	3	0	0	3
2.	PPMC3PE02	Deep Learning	PE	3	3	0	0	3
3.	PPMC3PE03	Big Data Analytics	PE	3	3	0	0	3
4.	PPMC3PE04	Data Visualization Techniques	PE	3	3	0	0	3
5.	PPMC3PE05	Business Data Analytics	PE	3	3	0	0	3
6.	PPMC3PE06	Information Retrieval Techniques	PE	3	3	0	0	3
7.	PPMC3PE07	DevOps and Microservices	PE	3	3	0	0	3
8.	PPMC3PE08	Security and Privacy in Cloud	PE	3	3	0	0	3

SUMMARY

S.NO	Subject Area	I	II	III	IV	Total Credits
		Credits Per Semester				
1	Foundation Courses (FC)	4				4
3	Professional Core (PC) 12	16	14	10		40
4	Professional Elective (PE)		6	6		12
5	Open Elective (OE)			3		3
6	Industry Lecture (IL)		√			0
7	Professional Laboratory (PL)	4	4	4		12
8	Professional Development (PD)	1	1			2
9	Project (PR)			1	12	13
10	Audit Course (AC)	√	√			0
Total		25	25	24	12	86

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9.	PPMC3PE09	Cloud Services Management	PE	3	3	0	0	3
10.	PPMC3PE10	Storage Technologies	PE	3	3	0	0	3
11.	PPMC3PE11	Virtualization	PE	3	3	0	0	3

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

S.NO.	COURSE CODE	COURSE NAME	PERIODS PER WEEK			CREDITS
			L	T	P	
1	PPMC1AC01	English for Research Paper Writing	2	0	0	0
2	PPMC2AC02	Disaster Management	2	0	0	0
3	PPMC2AC03	Constitution of India	2	0	0	0

BRIDGE COURSES

(For the M.C.A students admitted under non-computer-science background category)

S.NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	PPMC1BC01	Data Structures and Algorithms	BC	3	0	2	5	0
2.	PPMC1BC02	Problem Solving and Programming in C	BC	3	0	2	5	0
3.	PPMC2BC03	Introduction to Computer Organization and Operating Systems	BC	3	0	0	3	0
4.	PPMC2BC04	Database Management Systems	BC	53	0	2	5	0
5.	PPMC3BC05	Web Design	BC	3	0	0	3	0
6.	PPMC3BC06	Basics of Computer Networks	BC	3	0	0	3	0

PPMC1FC01	APPLIED PROBABILITY AND STATISTICS FOR COMPUTER SCIENCE ENGINEERS	L T P C 3 1 0 4

COURSE OBJECTIVE

- To encourage students to develop a working knowledge of the central ideas of Linear Algebra
- To enable students to understand the concepts of Probability and Random Variables.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the central limit theorem.
- To apply the small / large sample tests through Tests of hypothesis
- To enable the students to use the concepts of multivariate normal distribution and principal components analysis

UNIT – I LINEAR ALGEBR **12**

Vector spaces – norms – Inner Products – Eigenvalues using QR transformations – QR factorization – generalized eigenvectors – Canonical forms – singular value decomposition and applications – pseudo inverse – least square approximations.

UNIT - II PROBABILITY AND RANDOM VARIABLES **12**

Probability – Axioms of probability – Conditional probability – Bayes theorem – Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson , Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.

UNIT - III TWO DIMENSIONAL RANDOM VARIABLES **12**

Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation.

UNIT - IV TESTING OF HYPOTHESIS **12**

Sampling distributions – Type I and Type II errors – Small and Large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean , variance and proportions – Tests for independence of attributes and goodness of fit.

UNIT – V MULTIVARIATE ANALYSIS **12**

Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components – Population principal components – Principal components from standardized variables.

TOTAL : 60PERIODS

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COURSE OUTCOMES	Blooms Level
On successful completion of this course, the student will be able to.	
CO 1: Apply the concepts of Linear Algebra to solve practical problems	Applying
CO 2: Use the ideas of probability and random variables in solving engineering problems	Applying
CO 3 : Be familiar with some of the commonly encountered two dimension random variables and be equipped for a possible extension to multivariate analysis.	Understanding
CO 4 : Use statistical tests in testing hypothesis on data.	Understanding
CO 5 : Develop critical thinking based on empirical evidence and the scientific approach to knowledge development.	Creating

TEXT BOOKS:
1. Johnson R. A. and Gupta C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson India Education, Asia, 9th Edition, New Delhi, 2017.
2. Dallas E Johnson, "Applied multivariate methods for data Analysis", Thomson and Duxbury press, Singapore, 1998
REFERENCE BOOKS:
1. Richard A. Johnson and Dean W. Wichern, "Applied multivariate statistical Analysis", Pearson Education, Fifth Edition, 6th Edition, New Delhi, 2013
2. Bronson, R.,"Matrix Operation" Schaum's outline series, Tata McGraw Hill, New York, 2011
3. Oliver C. Ibe, "Fundamentals of Applied probability and Random Processes", Academic Press, Boston, 2014.

CO - PO MAPPING:

COs	POs						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	-	2	2	1	2	2	2	2
CO2	2	-	2	2	1	1	2	2	2
CO3	2	-	2	1	1	1	2	2	2
CO4	3	1	2	2	1	2	2	2	2
CO5	3	-	2	3	1	3	2	2	2

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PPMC1PC01	ADVANCED DATA STRUCTURES AND ALGORITHMS	L T P C 3 0 0 3

COURSE OBJECTIVE

- To understand the usage of algorithms in computing
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications.
- To select and design data structures and algorithms that is appropriate for problems
- To study about NP Completeness of problems.

UNIT I: ROLE OF ALGORITHMS IN COMPUTING & COMPLEXITY ANALYSIS 9

Algorithms – Algorithms as a Technology -Time and Space complexity of algorithms- Asymptotic analysis-Average and worst-case analysis-Asymptotic notation-Importance of efficient algorithms Program erformance measurement - Recurrences: The Substitution Method – The Recursion-Tree Method- Data structures and algorithms.

UNIT II HIERARCHICAL DATA STRUCTURES 9

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of B - trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Heap – Heap Implementation – Disjoint Sets - Fibonacci Heaps: structure – Mergeable-heap operations Decreasing a key and deleting a node-Bounding the maximum degree

UNIT III - GRAPHS 9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; Dynamic Programming - All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm.

UNIT IV - ALGORITHM DESIGN TECHNIQUES 9

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: – Elements of the Greedy Strategy- An Activity-Selection Problem - Huffman Coding.

UNIT - V:NP COMPLETE AND NP HARD 9

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP- Completeness and Reducibility – NP-Completeness Proofs – NP-Complete Problems.

TOTAL : 45 PERIODS

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COURSE OUTCOMES	Blooms Level
On successful completion of this course, the student will be able to.	
• Design data structures and algorithms to solve computing problems.	Creating
• Choose and implement efficient data structures and apply them to solve problems.	Understanding
• Design algorithms using graph structure and various string-matching algorithms to solve real-life problems	Applying
• Design one's own algorithm for an unknown problem.	Applying
• Apply suitable design strategy for problem solving	Applying

TEXT BOOKS:
1. S.Sridhar," Design and Analysis of Algorithms", Oxford University Press, 1st Edition, 2014.
2. Adam Drozdex, "Data Structures and Algorithms in C++", Cengage Learning, 4th Edition, 2013
REFERENCE BOOKS:
1. T.H. Cormen, C.E.Leiserson, R.L. Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2012
2. Mark Allen Weiss, "Data Structures and Algorithms in C++", Pearson Education, 3rd Edition, 2009.

CO - PO MAPPING:

COs	POs						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	3	2	1	2	3	3	2
CO2	2	1	3	2	2	2	3	3	2
CO3	2	1	3	2	2	2	3	2	2
CO4	3	1	3	2	2	2	3	3	2
CO5	3	1	3	3	2	2	3	2	2

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PPMC1PC02	OBJECT ORIENTED SOFTWARE ENGINEERING	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To understand the phases in object oriented software development
- To gain fundamental concepts of requirements engineering and analysis.
- To know about the different approach for object oriented design and its methods
- To learn about how to perform object oriented testing and how to maintain software
- To provide various quality metrics and to ensure risk management

UNIT I:SOFTWARE DEVELOPMENT AND PROCESS MODELS 9

Introduction to Software Development – Challenges – An Engineering Perspective – Object Orientation – Software Development Process – Iterative Development Process – Process Models – Life Cycle Models – Unified Process – Iterative and Incremental – Agile Processes

UNIT II MODELING OO SYSTEMS 9

Object Oriented Analysis (OOA / Coad-Yourdon), Object Oriented Design (OOD/Booch), Hierarchical Object Oriented Design (HOOD), Object Modeling Technique (OMT) – Requirement Elicitation – Use Cases – SRS Document – OOA - Identification of Classes and Relationships, Identifying State and Behavior – OOD - Interaction Diagrams – Sequence Diagram – Collaboration Diagrams -v Unified Modeling Language and Tool

UNIT III - DESIGN PATTERNS 9

Design Principles – Design Patterns – GRASP – GoF – Dynamic Object Modeling – Static Object Modeling.

UNIT IV - SYSTEM TESTING 9

Software testing: Software Verification Techniques – Object Oriented Checklist :- Functional Testing – Structural Testing – Class Testing – Mutation Testing – Levels of Testing – Static and Dynamic Testing Tools - Software Maintenance – Categories – Challenges of Software Maintenance – Maintenance of Object Oriented Software – Regression Testing

UNIT - V: SOFTWARE QUALITY AND METRICS 9

Need of Object Oriented Software Estimation – Lorenz and Kidd Estimation – Use Case Points Method – Class Point Method – Object Oriented Function Point – Risk Management – Software Quality Models – Analyzing the Metric Data – Metrics for Measuring Size and Structure – Measuring Software Quality - Object Oriented Metrics

COURSE OUTCOMES:	**Blooms Level**
CO 1 : Design object oriented software using appropriate process models.	Apply
CO 2 : Differentiate software processes under waterfall and agile methodology.	Remember
CO 3: Design and Develop UML diagrams for software projects.	Apply
CO 4 : Categorize testing methods and compare different testing tools for software processes.	Understand
CO 5 : Analyze object oriented metrics and quality for software engineering processes.	Apply

TOTAL: 45 PERIODS

TEXT BOOK

1. Yogesh Singh, RuchikaMalhotra, " Object – Oriented Software Engineering", PHI Learning Private Limited ,First edition,2012
2. Ivar Jacobson. Magnus Christerson, PatrikJonsson, Gunnar Overgaard, "Object Oriented Software Engineering, A Use Case Driven Approach", Pearson Education, Seventh Impression, 2009

REFERENCES:

1. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, "Object Oriented Analysis & Design with Applications, Third Edition, Pearson Education,2010
2. Roger S. Pressman, "Software Engineering: A Practitioner's Approach, Tata McGraw-Hill Education, 8th Edition, 2015

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	3	3	2	2	2	3	2
CO2	2	1	3	2	2	2	2	3	2
CO3	2	1	3	3	2	2	2	2	2
CO4	2	1	3	3	3	2	2	3	2
CO5	2	1	3	3	1	2	2	2	2

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PPMC1PC03	PYTHON PROGRAMMING	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To develop Python programs with conditionals, loops and functions.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python
- To use modules, packages and frameworks in python
- To define a class with attributes and methods in python

UNIT I: BASICS OF PYTHON 9

Introduction to Python Programming – Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements. Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If-Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement-Continue statement – Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Function

UNIT II DATA TYPES IN PYTHON 9

Lists, Tuples, Sets, Strings, Dictionary, Modules: Module Loading and Execution – Packages – Making Your Own Module – The Python Standard Libraries.

UNIT III - FILE HANDLING AND EXCEPTION HANDLING 9

Files: Introduction – File Path – Opening and Closing Files – Reading and Writing Files –File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions

UNIT IV - MODULES & PACKAGES 9

Modules: Introduction – Module Loading and Execution – Packages – Making Your Own Module –The Python Libraries for data processing, data mining and visualization- NUMPY, Pandas, Matplotlib, Plotly-Frameworks- -Django, Flask, Web2Py

UNIT - V: OBJECT ORIENTED PROGRAMMING IN PYTHON 9

Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence

COURSE OUTCOMES:	Blooms Level
CO 1 : Develop algorithmic solutions to simple computational problems	Apply
CO 2 : Represent compound data using Python lists, tuples and dictionaries.	Remember
CO 3 : Read and write data from/to files in Python Programs	Understand
CO 4 : Structure simple Python programs using libraries, modules etc.	Cerate
CO 5 : Structure a program by bundling related properties and behaviors into individual objects	Create

TOTAL: 45 PERIODS

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TEXT BOOK

1. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, First edition, 2017
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff, O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/

REFERENCES:

1. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised and Updated for Python 3.2, Network Theory Ltd., First edition, 2011
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press, 2013
3. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, First Edition, 2016

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	1	3	3	2	3	3	3	2
CO2	1	1	3	3	1	2	3	3	2
CO3	1	1	3	3	2	2	3	3	2
CO4	3	1	3	3	3	3	3	3	2
CO5	2	1	3	3	3	3	3	3	2

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PPMC1PC04	CLOUD COMPUTING TECHNOLOGIES	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To understand the basic concepts of Distributed systems.
- To learn about the current trend and basics of Cloud computing.
- To be familiar with various Cloud concepts.
- To expose with the Server, Network and storage virtualization.
- To be aware of Microservices and DevOps.

UNIT I: DISTRIBUTED SYSTEMS 9

Introduction to Distributed Systems – Characterization of Distributed Systems – Distributed Architectural Models –Remote Invocation – Request-Reply Protocols – Remote Procedure Call – Remote Method Invocation – Group Communication – Coordination in Group Communication – Ordered Multicast – Time Ordering – Physical Clock Synchronization – Logical Time and Logical Clocks.

UNIT II BASICS OF CLOUD COMPUTING 9

Cloud Computing Basics – Desired features of Cloud Computing – Elasticity in Cloud – On demand provisioning - Applications – Benefits – Cloud Components: Clients, Datacenters & Distributed Servers – Characterization of Distributed Systems – Distributed Architectural Models - Principles of Parallel and Distributed computing - Applications of Cloud computing – Benefits – Cloud services – Open source Cloud Software: Eucalyptus, Open Nebula, Open stack, Aneka, Cloudsim.

UNIT III - CLOUD INFRASTRUCTURE 9

Cloud Architecture and Design – Architectural design challenges – Technologies for Network based system - NIST Cloud computing Reference Architecture – Public, Private and Hybrid 28 clouds – Cloud Models : IaaS, PaaS and SaaS – Cloud storage providers - Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.

UNIT IV - CLOUD ENABLING TECHNOLOGIES**9** **9**

Service Oriented Architecture – Web Services – Basics of Virtualization – Emulation – Types of Virtualization – Implementation levels of Virtualization – Virtualization structures – Tools & Mechanisms – Virtualization of CPU, Memory & I/O Devices – Desktop Virtualization – Server Virtualization – Google App Engine – Amazon AWS - Federation in the Cloud.

UNIT - V: MICROSERVICES AND DEVOPS 9

Defining Microservices - Emergence of Microservice Architecture – Design patterns of Microservices – The Mini web service architecture – Microservice dependency tree – Challenges with Microservices - SOA vs Microservice – Microservice and API – Deploying and maintaining Microservices – Reason for having DevOps – Overview of DevOps – Core elements of DevOps – Life cycle of DevOps – Adoption of DevOps - DevOps Tools – Build, Promotion and Deployment in DevOps.

TOTAL: 45 PERIODS

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COURSE OUTCOMES:	Blooms Level.
• Use Distributed systems in Cloud Environment.	Create
• Articulate the main concepts, key technologies, strengths and limitations of Cloud computing.	Understand
• Identify the Architecture, Infrastructure and delivery models of Cloud computing.	Remember
• Install, choose and use the appropriate current technology for the implementation of Cloud.	Apply
• Adopt Microservices and DevOps in Cloud environments	Apply

TEXT BOOK

1. Kai Hwang, Geoffrey C. Fox & Jack J.Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, First Edition, 2012
2. Richard Rodger, "The Tao of Microservices", ISBN 9781617293146, Manning Publications, First Edition, December 2017.

REFERENCES

1. Andrew S. Tanenbaum & Maarten Van Steen,"Distributed Systems - Principles and Paradigms", Third Edition, Pearson, 2017.
2. Thomas Erl, Zaigham Mahood & Ricardo Puttini, "Cloud Computing, Concept, Technology & Architecture", Prentice Hall, SecondEdition, 2013.
3. Magnus Larsson, "Hands-On Microservices with Spring Boot and Spring Cloud: Build and deploy microservices using spring cloud, Istio and kubernetes", Packt Publishing Ltd, First Edition, September 2019.

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	2	2	2	2	3	3	2
CO2	2	1	2	2	2	2	3	3	2
CO3	3	1	3	2	2	2	3	3	2
CO4	2	1	2	2	2	2	3	3	2
CO5	2	1	2	2	2	2	3	3	2

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PPMC1PC05	JAVA PROGRAMMING	L T P C
		3 0 2 4

COURSE OBJECTIVE

- To provide an overview of working principles of internet, web related functionalities
- To understand and apply the fundamentals core java, packages, database connectivity for computing
- To develop Java based web programming
- To enhance the knowledge to server side programming
- To Understand the OOPS concept & how to apply in programming

UNIT I: JAVA FUNDAMENTALS 9 +6

Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Classes, Methods – Inheritance - Packages and Interfaces – Boxing, Un boxing – Variable-Length Arguments (Varargs), Exception Handling

UNIT II COLLECTIONS AND ADVANCE FEATURES 9 +6

Utility Packages- Introduction to collection –Hierarchy of Collection framework – Generics, Array list, LL, Hash Set, Tree set, Hash Map – Comparators – Java annotations – Pre main method.

UNIT III - ADVANCED JAVAPROGRAMMING 9 +6

Input Output Packages – Inner Classes – Java Database Connectivity - Introduction JDBC Drivers - JDBC connectivity with MySQL/Oracle -Prepared Statement & Result Set – JDBC Stored procedures invocation - Servlets - RMI – Swing Fundamentals - Swing Classes

UNIT IV - OVERVIEW OF DATA RETRIEVAL & ENTERPRISE APPLICATION DEVELOPMENT 9 +6

Tiered Application development - Java Servers, containers –Web Container – Creating Web Application using JSP/Servlets – Web Frameworks Introduction to Spring/ Play Framework – ORM Layer – Introduction to Hibernate.

UNIT - V: JAVA INTERNALS AND NETWORKING 9 +6

Java jar Files-Introspection – Garbage collection – Architecture and design – GC Cleanup process, Invoking GC, Generation in GC - Networking Basics Java and the Net – InetAddress – TCP/IP Client Sockets – URL –URL Connection – TCP/IP Server Sockets – A Caching Proxy HTTP Server – Datagrams

1. Writing Java programs by making use of class, interface, package, etc for the following
   - # Different types of inheritance study
   - # Uses of 'this' keyword
   - # Polymorphism
   - # Creation of user specific packages
   - # Creation of jar files and using them
   - # User specific exception handling
2. Writing window based GUI applications using frames and applets such as Calculator application, Fahrenheit to Centigrade conversion etc.
3. Application of threads examples
4. Create a Personal Information System using Swing
5. Reading and writing text files
6. Writing an RMI application to access a remote method
7. Writing a Servlet program with database connectivity for a web based application such as students result status checking, PNR number enquiry etc
8. Creation and usage of Java bean

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9. Create an Application to search Phone Number using contact Name Using Hash Map
10. Create an Application which finds the Duplicates in E-mail using Set Interface

COURSE OUTCOMES:	Blooms Level
• Implement Java programs.	Create
• Apply the Object Oriented features of Java for programming on the internet	Apply
• Make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API	Create
• Use the frameworks JSP, Hibernate, Spring	Apply
• Design and implement server side programs using Servlets and JSP.	Create
TOTAL: 45 PERIODS	

TEXT BOOK

1. Amritendu De, "Spring 4 and Hibernate 4: Agile Java Design and Development", McGraw-Hill Education, 2015
2. R. Nageswara Rao,"Core Java: An Integrated Approach", DreamTech Press, 2016

REFERENCES:

1. Herbert Schildt, The Complete Reference – Java 2, Ninth Edition, Tata McGraw Hill, 2014
2. Joyce Farrell, "Java Programming", Cengage Learning, Seventh Edition, 2014
3. John Dean, Raymond Dean, "Introduction to Programming with JAVA – A Problem Approach", Tata Mc Graw Hill, 2014
4. Mahesh P. Matha, "Core Java A Comprehensive Study", Prentice Hall of India, 2011

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	1	3	3	2	3	2	3	2
CO2	1	1	3	3	1	2	2	3	3
CO3	1	1	3	3	2	2	2	3	3
CO4	3	1	3	3	3	3	2	3	2
CO5	2	1	3	3	3	3	3	3	2

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PPMC1PL01	ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY	L T P C
		0 0 4 2

COURSE OBJECTIVE

- To acquire the knowledge of using advanced tree structures
- To learn the usage of heap structures
- To understand the usage of graph structures and spanning trees
- To understand the problems such as matrix chain multiplication, activity selection and Huffman coding
- To understand the necessary mathematical abstraction to solve problems.

LIST OF EXPERIMENTS:

1. Implementation of recursive function for tree traversal and Fibonacci
2. Implementation of iteration function for tree traversal and Fibonacci
3. Implementation of Merge Sort and Quick Sort
4. Implementation of a Binary Search Tree
5. Red-Black Tree Implementation
6. Heap Implementation
7. Fibonacci Heap Implementation
8. Graph Traversals
9. Spanning Tree Implementation
10. Shortest Path Algorithms (Dijkstra's algorithm, Bellman Ford Algorithm)
11. Implementation of Matrix Chain Multiplication
12. Activity Selection and Huffman Coding Implementation

TOTAL : 60 PERIODS

COURSE OUTCOMES:	**Blooms Level**
• Design and implement basic and advanced data structures extensively	Apply
• Design algorithms using graph structures	Apply
• Design and develop efficient algorithms with minimum complexity using design techniques	Apply
• Develop programs using various algorithms.	Create
• Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem	Understand

TEXT BOOK

1. Lipschutz Seymour, "Data Structures Schaum's Outlines Series", Tata McGraw Hill, 3rd Edition, 2014.

REFERENCE:

2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

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WEBSITE REFERENCE:

1. http://www.coursera.org/specializations/data-structures-algorithms
2. http://www.tutorialspoint.com/data_structures_algorithms
3. http://www.geeksforgeeks.org/data-structures/

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	3	1	2	2	2	3	2
CO2	2	1	1	1	3	3	2	3	3
CO3	3	1	1	1	3	3	2	2	3
CO4	3	1	3	1	3	3	2	2	2
CO5	3	1	2	1	3	3	3	2	2

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PPMC1PL02	PYTHON PROGRAMMING LABORATORY	L T P C
		0 0 4 2

COURSE OBJECTIVE

- Develop Python programs with conditionals, loops and functions
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python
- Implement NumPy, Pandas, Matplotlib libraries
- Implement object oriented concepts

LIST OF EXPERIMENTS:

1. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
2. Scientific problems using Conditionals and Iterative loops.
3. Linear search and Binary search
4. Selection sort, Insertion sort
5. Merge sort, Quick Sort
6. Implementing applications using Lists, Tuples.
7. Implementing applications using Sets, Dictionaries.
8. Implementing programs using Functions.
9. Implementing programs using Strings.
10. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
11. Implementing real-time/technical applications using File handling.
12. Implementing real-time/technical applications using Exception handling.
13. Creating and Instantiating classes

HARDWARE/SOFTWARE REQUIREMENTS:

1. Processors: Intel Atom® processor Intel®Core™i3 processor
2. Disk space: 1GB.
3. Operating systems: Windows 7,macOS and Linux
4. Python versions:2.7, 3.6, 3.8

TOTAL : 60 PERIODS

COURSE OUTCOMES:	Blooms Level
• Apply the Python language syntax including control statements, loops and functions to solve a wide variety of problems in mathematics and science.	Apply
• Use the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data	Apply
• Create files and perform read and write operations	Create
• Illustrate the application of python libraries.	Remember
• Handle exceptions and create classes and objects for any real time applications	Understand

TEXT BOOK

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second Edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.
2. Shroff “Learning Python: Powerful Object-Oriented Programming; Fifth edition, 2013.

REFERENCE:

1. David M.Beazley “Python Essential Reference”. Addison-Wesley Professional; Fourth edition, 2009.
2. David M. Baezly “Python Cookbook” O’Reilly Media; Third edition (June 1, 2013).

WEBSITE REFERENCE:

1. http://www.edx.org/

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	3	3	2	2	2	3	2
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CO3	1	1	3	2	2	2	2	2	3
CO4	2	1	3	2	2	2	2	2	2
CO5	2	1	3	3	2	3	3	2	2

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PPMC1PD01	COMMUNICATION SKILLS – I	L T P C
		0 0 2 1

COURSE OBJECTIVE

- To provide opportunities to learners to practice English and thereby make them proficient users of the language.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology
- To improve the performance of students' listening, speaking, reading and writing skills and thereby enhance their career opportunities.

LIST OF ACTIVITIES:

1. Listening:
   - Listening and practicing neutral accents
   - Listening to short talks and lectures and completing listening comprehension exercises
   - Listening to TED Talks
2. Speaking:
   - Giving one minute talks
   - Participating in small Group Discussions
   - Making Presentations
3. Reading:
   - Reading Comprehension
   - Reading subject specific material
   - Technical Vocabulary
4. .Writing:
   - Formal vs Informal Writing
   - Paragraph Writing
   - Essay Writing
   - Email Writing

9

REFERENCES / MANUALS / SOFTWARE:

- Open Sources / websites

TOTAL: 30 PERIODS

COURSE OUTCOMES:	Blooms Level
• Listen and comprehend lectures in English	Understand
• Articulate well and give presentations clearly	Remember
• Participate in Group Discussions successfully	Remember
• Communicate effectively in formal and informal writing	Apply
• Write proficient essays and emails	Apply

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CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	1	2	2	1	1	1	2	3	2
CO2	1	3	2	1	1	1	2	3	3
CO3	1	2	3	1	1	1	2	2	3
CO4	1	3	2	1	1	1	2	2	2
CO5	1	3	2	1	1	1	3	2	2

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PPMC2PC06	FULL STACK WEB DEVELOPMENT	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To understand the fundamentals of web programming and client side scripting.
- To learn server side development using NodeJS.
- To understand API development with Express Framework.
- To understand and architect databases using NoSQL and SQL databases.
- To learn the advanced client side scripting and ReactJS framework

UNIT I :INTRODUCTION TO CSS and JAVASCRIPT 9

Introduction to Web: Server - Client - Communication Protocol (HTTP) – Structure of HTML Documents – Basic Markup tags – Working with Text and Images with CSS– CSS Selectors – CSS Flexbox - JavaScript: Data Types and Variables - Functions - Events – AJAX: GET and POST

UNIT II:SERVER SIDE PROGRAMMING WITH NODE JS 9

Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines – Static Files - async/await - Fetching JSON from Express

UNIT III :ADVANCED NODE JS AND DATABASE 9

Introduction to NoSQL databases – MongoDB system overview - Basic querying with MongoDB shell – Request body parsing in Express – NodeJS MongoDB connection – Adding and retrieving data to MongoDB from NodeJS – Handling SQL databases from NodeJS – Handling Cookies in NodeJS – Handling User Authentication with NodeJS

UNIT IV: ADVANCED CLIENT SIDE PROGRAMMING 9

React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - -JS Localstorage - Events - Lifting State Up - Composition and Inheritance

UNIT - V: APP IMPLEMENTATION IN CLOUD 9

Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes

TOTAL: 45 PERIODS

COURSE OUTCOMES:	Blooms Level
• Write client side scripting HTML, CSS and JS.	Create
• Implement and architect the server side of the web application.	Apply
• Implement Web Application using NodeJS.	Apply
• Architect NoSQL databases with MongoDB.	Create
• Implement a full-stack Single Page Application using React, NodeJS and MongoDB and deploy on Cloud.	Apply

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TEXT BOOK

1. David Flanagan, "Java Script: The Definitive Guide", O'Reilly Media, Inc, 7th Edition, 2020
2. .Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019
3. Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020

REFERENCES:

1. Marc Wandschneider, "Learning Node", Addison-Wesley Professional, 2nd Edition, 2016
2. Joe Beda, Kelsey Hightower, Brendan Burns, "Kubernetes: Up and Running", O'Reilly Media, 1 st edition, 2017
3. Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, Sai Vennam, "Cloud Without Compromise", O'Reilly Media, 1st edition, 2021

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	1	1	2	2	2	2	2	3	2
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CO3	2	1	3	2	3	2	2	2	3
CO4	2	1	3	2	3	3	2	2	2
CO5	2	1	3	2	3	3	3	2	2

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PPMC2PC07	MACHINE LEARNING	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To gain knowledge on foundations of machine learning and apply suitable dimensionality reduction techniques for an application
- To select the appropriate model and use feature engineering techniques
- To gain knowledge on Probability and Bayesian Learning to solve the given problem
- To design and implement the machine learning techniques for real world problems
- To analyze, learn and classify complex data without predefined models also

UNIT I :INTRODUCTION 9

Human Learning - Types – Machine Learning - Types - Problems not to be solved - Applications - Languages/Tools– Issues. Preparing to Model: Introduction - Machine Learning Activities - Types of data - Exploring structure of data - Data quality and remediation - Data Pre-processing

UNIT II MODEL EVALUATION AND FEATURE ENGINEERING 9

Model Selection - Training Model - Model Representation and Interpretability - Evaluating Performance of a Model - Improving Performance of a Model - Feature Engineering: Feature Transformation - Feature Subset Selection

UNIT III : BAYESIAN LEARNING
9

Basic Probability Notation- Inference – Independence - Bayes' Rule. Bayesian Learning: Maximum Likelihood and Least Squared error hypothesis-Maximum Likelihood hypotheses for predicting probabilities- Minimum description Length principle -Bayes optimal classifier - Naïve Bayes classifier - Bayesian Belief networks -EM algorithm

UNIT IV: PARAMETRIC MACHINE LEARNING 9

Logistic Regression: Classification and representation – Cost function – Gradient descent – Advanced optimization – Regularization - Solving the problems on overfitting. Perceptron – Neural Networks – Multi – class Classification - Backpropagation – Non-linearity with activation functions (Tanh, Sigmoid, Relu, PRelu) - Dropout as regularization

UNIT - V: NON PARAMETRIC MACHINE LEARNING 9

k- Nearest Neighbors- Decision Trees – Branching – Greedy Algorithm - Multiple Branches – Continuous attributes – Pruning. Random Forests: ensemble learning. Boosting – Adaboost algorithm. Support Vector Machines – Large Margin Intuition – Loss Function - Hinge Loss – SVM Kernels

TOTAL: 45 PERIODS

COURSE OUTCOMES:	Blooms Level
• Understand about Data Preprocessing, Dimensionality reduction	Understand
• Apply proper model for the given problem and use feature engineering techniques	Apply
• Make use of Probability Technique to solve the given problem.	Create
• Analyze the working model and features of Decision tree	Analyze
• choose and apply appropriate algorithm to learn and classify the data	Apply

TEXT BOOK

1. Ethem Alpaydin, "Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", Third Edition, MIT Press, 2014
2. Tom M. Mitchell, "Machine Learning", India Edition, 1st Edition, McGraw-Hill Education Private Limited, 2013
3. Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, "Machine Learning", 1st Edition, Pearson Education, 2019

REFERENCES:

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Revised Edition, Springer, 2016
2. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 2nd Edition, O"Reilly, 2019
3. Stephen Marsland, "Machine Learning – An Algorithmic Perspectivel, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	1	1	2	2	2	2	2	3	3
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CO3	2	1	2	2	2	2	2	3	2
CO4	2	1	2	2	2	2	2	2	2
CO5	2	1	2	2	2	2	3	2	2

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PPMC2PC08

PPMC1PL01	ADVANCED DATABASE TECHNOLOGY	L T P C
		3 0 2 4

COURSE OBJECTIVE

- To understand the working principles and query processing of distributed databases.
- To understand the basics of spatial, temporal and mobile databases and their applications.
- To distinguish the different types of NoSQL databases.
- To understand the basics of XML and create well-formed and valid XML documents.
- To gain knowledge about information retrieval and web search.

UNIT I: DISTRIBUTED DATABASES 9+6

Distributed Systems – Introduction – Architecture – Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing.

1. MySQL Queries

UNIT II SPATIAL AND TEMPORAL DATABASES 9+6

Active Databases Model – Design and Implementation Issues - Temporal Databases - Temporal Querying - Spatial Databases: Spatial Data Types, Spatial Operators and Queries – Spatial Indexing and Mining – Applications –- Mobile Databases: Location and Handoff Management, Mobile Transaction Models – Deductive Databases - Multimedia Databases.

1. Spatial data storage and retrieval in MySQL
2. Temporal data storage and retrieval in MySQL

UNIT III - NOSQL DATABASES 9+6

NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding–Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types – HIVE: Data types, Database Operations, Partitioning – HiveQL – OrientDB Graph database – OrientDB Features.

1. MongoDB – CRUD operations, Indexing, Sharding
2. Cassandra: Table Operations, CRUD Operations, CQL Types
3. HIVE: Data types, Database Operations, Partitioning – HiveQL
4. OrientDB Graph database – OrientDB Features

UNIT IV - XML DATABASES 9+6

Structured, Semi structured, and Unstructured Data – XML Hierarchical Data Model – XML Documents – Document Type Definition – XML Schema – XML Documents and Databases – XML Querying – XPath – XQuery

1. XML Databases , XML table creation,
2. XQuery FLWOR expression.

UNIT - V: INFORMATION RETRIEVAL AND WEB SEARCH 9+6

IR concepts – Retrieval Models – Queries in IR system – Text Preprocessing – Inverted Indexing – Evaluation Measures – Web Search and Analytics – Current trends.

1. Mobile Database Query Processing using open source DB (MongoDB/MySQL etc)

TOTAL: 75 PERIODS

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COURSE OUTCOMES:	Blooms Level
CO 1 : Design a distributed database system and execute distributed queries.	Apply
CO 2 : Manage Spatial and Temporal Database systems and implement it in corresponding applications.	Understand
CO 3 : Use NoSQL database systems and manipulate the data associated with it.	Create
CO 4 : Design XML database systems and validate with XML schema.	Apply
CO 5 : Apply knowledge of information retrieval concepts on web databases.	Apply

TEXT BOOK

1. Abraham Silberschatz, Henry F Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2019.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education/Addison Wesley, 2017.

REFERENCES:

1. Guy Harrison, "Next Generation Databases, NoSQL, NewSQL and Big Data", First Edition, Apress publishers, 2015
2. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", Third Edition, Morgan Kaufmann, 2012.
3. Brad Dayley, "Teach Yourself NoSQL with MongoDB in 24 Hours", Sams Publishing, First Edition, 2014.
4. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	2	2	2	2	2	3	3
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CO3	2	1	3	2	2	3	3	3	2
CO4	2	1	3	2	3	3	3	2	2
CO5	2	1	3	2	2	2	3	2	2

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PPMC2PC09	MOBILE APPLICATION DEVELOPMENT	L T P C
		3 0 2 4

COURSE OBJECTIVE

- To understand the need and characteristics of mobile applications.
- To design the right user interface for mobile applications.
- To understand the design issues in the development of mobile applications.
- To understand the development procedure for mobile applications.
- To develop mobile applications using various tools and platforms.

UNIT I: INTRODUCTION 9+6

Mobile Application Model – Infrastructure and Managing Resources – Mobile Device Profiles – Frameworks and Tools

- Installation of necessary components and software

UNIT II: USER INTERFACE 9+6

Generic UI Development - Multimodal and Multichannel UI –Gesture Based UI – Screen Elements and Layouts – Voice XML.

- i.Implement mobile applications using UI toolkits and frameworks.
- ii.Design an application that uses Layout Managers and event listeners.

UNIT III: APPLICATION DESIGN 9+6

Memory Management – Design Patterns for Limited Memory – Workflow for Application development – Java API – Dynamic Linking – Plugins and rule of thumb for using DLLs – Multithreading in Java - Concurrency and Resource Management.

- i. Design a mobile application that is aware of the resource constraints of mobile devices.
- ii.Design an application that uses Dynamic Linking

UNITIV: MOBILE OS 9+6

Mobile OS: Android, iOS – Android Application Architecture – Understanding the anatomy of a mobile application - Android basic components –Intents and Services – Storing and Retrieving data – Packaging and Deployment – Security and Hacking.

- i.Develop an application that makes use of mobile database
- ii.Implement an android application that writes data into the SD card.

UNIT V: APPLICATION DEVELOPMENT 9+6

Communication via the Web – Notification and Alarms – Graphics and Multimedia: Layer Animation, Event handling and Graphics services – Telephony – Location based services

- i.Develop a web based mobile application that accesses internet and location data.
- ii.Develop an android application using telephony to send SMS.

TOTAL: 75 PERIODS

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COURSE OUTCOMES	Blooms Level
CO 1 : Understand the basics of mobile application development frameworks and tools.	Understand
CO 2 : Develop a UI for mobile applications.	Create
CO 3 : Design mobile applications that manage memory dynamically.	Apply
CO 4: Build applications based on mobile OS like Android, iOs.	Create
CO 5 : Build location based services.	Create

SOFTWARE REQUIREMENTS

1. JDK, ECLIPSE IDE / equivalent, ANDROID STUDIO

TEXT BOOK

1. Reto Meier, Ian Lake, "Professional Android", 4th Edition, Wrox, 2018.
2. Zigurd Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura, "Programming Android", O'Reilly, 2nd Edition, 2012.

REFERENCES:

1. Alasdair Allan, "Learning iOS Programming", O'Reilly, Third Edition, 2013.
2. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, 4th edition, 2019.
3. Christian Keur, Aaron Hillegass, iOS Programming: The Big Nerd Ranch Guide, 6th Edition, O'Reilly, 2016.
4. .Barry Burd, "Android Application Development All-In-One for Dummies", 3rd Edition, 2021.

CO – PO Mapping

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CO4	2	1	3	2	2	3	2	2	2
CO5	2	1	3	2	2	2	3	2	2

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PPMC2PL02	FULL STACK WEB DEVELOPMENT LABORATORY	L T P C
		0 0 4 2

COURSE OBJECTIVE

- To implement the client side of the web application using javascript.
- To understand Javascript on the desktop using NodeJS.
- To develop a web application using NodeJS and Express.
- To implement a SPA using React.
- .To develop a full stack single page application using React, NodeJS, and a Database (MongoDB or SQL).

LIST OF EXPERIMENTS

1. Create a form and validate the contents of the form using JavaScript.
2. Get data using Fetch API from an open-source endpoint and display the contents in the form of a card.
3. Create a NodeJS server that serves static HTML and CSS files to the user without using Express.
4. Create a NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars.
5. Create a NodeJS server using Express that creates, reads, updates and deletes students' details and stores them in MongoDB database. The information about the user should be obtained from a HTML form.
6. Create a NodeJS server that creates, reads, updates and deletes event details and stores them in a MySQL database. The information about the user should be obtained from a HTML form.
7. Create a counter using ReactJS
8. Create a Todo application using ReactJS. Store the data to a JSON file using a simple NodeJS server and retrieve the information from the same during page reloads.
9. Create a simple Sign up and Login mechanism and authenticate the user using cookies. The user information can be stored in either MongoDB or MySQL and the server should be built using NodeJS and Express Framework.
10. Create and deploy a virtual machine using a virtual box that can be accessed from the host computer using SSH.
11. Create a docker container that will deploy a NodeJS ping server using the NodeJS image.

SOFTWARE REQUIREMENTS

1.NodeJS/ExpressJS,ReactJS, Docker,any IDE like NOTEPAD++/visual studiocode/sublime text etc.,

2.MySQL, MongoDB

TOTAL: 60 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : To implement and deploy the client side of the web application.	Create
CO 2 : To develop and deploy server side applications using NodeJS.	Apply
CO 3 : To use Express framework in web development.	Create
CO 4 : To implement and architect database systems in both NoSQL and SQL environments.	Create
CO 5 : To develop a full stack single page application using React, NodeJS, and a Database and deploy using containers.	Apply

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	3	2	2	2	2	3	3
CO2	2	1	3	2	2	2	2	3	3
CO3	2	1	3	2	3	3	2	3	2
CO4	2	1	3	2	2	3	2	2	2
CO5	2	1	3	2	2	2	3	2	2

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04

PPMC2PL03	MACHINE LEARNING LABORATORY	L T P C
		0 0 4 2

COURSE OBJECTIVE

- To understand about data cleaning and data preprocessing
- To familiarize with the Supervised Learning algorithms and implement them in practical situations.
- To familiarize with unsupervised Learning algorithms and carry on the implementation part.
- To involve the students to practice ML algorithms and techniques.
- Learn to use algorithms for real time data sets.

LIST OF EXPERIMENTS

1. Demonstrate how do you structure data in Machine Learning
2. Demonstrate how do you structure data in Machine Learning
3. Implement Feature subset selection techniques
4. Demonstrate how will you measure the performance of a machine learning model
5. Write a program to implement the naïve Bayesian classifier for a sample training data set. Compute the accuracy of the classifier, considering few test data sets.
6. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using the standard Heart Disease Data Set.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file
8. Write a program to implement k-Nearest Neighbor algorithm to classify the data set.
9. Apply the technique of pruning for a noisy data monk2 data, and derive the decision tree from this data. Analyze the results by comparing the structure of pruned and unpruned tree.
10. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
11. Implement Support Vector Classification for linear kernels.
12. Implement Logistic Regression to classify problems such as spam detection. Diabetes predictions and so on.

SOFTWARE REQUIREMENTS

Python or any ML tools like R

TOTAL: 60 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : Apply data preprocessing technique and explore the structure of data to prepare for predictive modeling	Create
CO 2 : Understand how to select and train a model and measure the performance.	Understand
CO 3 : Apply feature selection techniques in Machine Learning	Create
CO 4 : Construct Bayesian Network for appropriate problem	Create
CO 5 : Learn about parametric and non-parametric machine Learning algorithms and implement to practical situations	Understand

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CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	2	2	2	2	2	3	3
CO2	2	1	2	2	2	2	2	3	3
CO3	2	1	2	2	2	2	3	3	2
CO4	2	1	2	2	2	2	3	2	2
CO5	2	1	2	2	2	2	3	2	2

PPMC2PD02	COMMUNICATION SKILLS – II	L T P C
		0 0 4 2

COURSE OBJECTIVE

- To provide opportunities to learners to practice English and thereby make them proficient usersof the language.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology.
- To improve the performance of students' listening, speaking, reading and writing skills and thereby enhance their career opportunities.

LIST OF ACTIVITIES:

1. Listening:
   - Listening and practicing neutral accents
   - Listening to short talks and lectures and completing listening comprehension exercises
   - Listening to TED Talks

2.Speaking:

- Giving one minute talks
- Participating in small Group Discussions
- Making Presentations

3.Reading:

- Reading Comprehension
- Reading subject specific material
- Technical Vocabulary

4.Writing:

- Formal vs Informal Writing
- Paragraph Writing
- Essay Writing
- Email Writing

REFERENCES / MANUALS / SOFTWARE:

Open Sources / websites

TOTAL: 30 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : Listen and comprehend lectures in English	Understand
CO 2: Articulate well and give presentations clearly	Remember
CO 3 : Participate in Group Discussions successfully	Apply
CO 4 : Communicate effectively in formal and informal writing	Apply
CO 5 : Write proficient essays and emails	Create

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	1	2	1	1	1	1	2	3	3
CO2	1	2	1	1	1	1	2	3	3
CO3	1	2	1	1	1	1	3	3	2
CO4	1	2	1	1	1	1	3	2	2
CO5	1	2	1	1	1	1	3	2	2

PPMC2PE01	SOFTWARE PROJECT MANAGEMENT	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To know how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software

UNIT I: SOFTWARE PROJECT MANAGEMENT CONCEPTS 9

ntroduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources- Six Sigma, Software Quality: defining software quality, ISO9126, External Standards.

UNIT II: SOFTWARE EVALUATION AND COSTING 9

Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, structured methods.

UNIT III: SOFTWARE ESTIMATION TECHNIQUES 9

Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model.

UNITIV: RISK MANAGEMENT 9

Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.

UNIT V: GLOBALIZATION ISSUES IN PROJECT MANAGEMENT 9

Globalization issues in project management: Evolution of globalization- challenges in building global teams-models for the execution of some effective management techniques for managing global teams. Impact of the internet on project management: Introduction – the effect of the internet on project management – managing projects for the internet – effect on project management activities. Comparison of project management software: dot Project, Launch pad, openProj. Case study: PRINCE2.

TOTAL: 45 PERIODS

COURSE OUTCOMES	Blooms Level
CO1: Understand the activities during the project scheduling of any software application.	Understand
CO2: Learn the risk management activities and the resource allocation for the projects.	Create
CO3: Apply the software estimation and recent quality standards for evaluation of the software projects	Apply
CO4: Acquire knowledge and skills needed for the construction of highly reliable software project	Create
CO5: Create reliable, replicable cost estimation that links to the requirements of project planning and managing	Create

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TEXT BOOK

1. Reto Meier, Ian Lake, "Professional Android", 4th Edition, Wrox, 2018.
2. Zigurd Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura, "Programming Android", O'Reilly, 2nd Edition, 2012.

REFERENCES:

1. Bob Hughes, Mike Cotterell & Rajib Mall "Software Project Management", McGraw- Hill Publications, 6th Edition 2017.
2. Ian Somerville, "Software Engineering", 10th Edition, Pearson Education, 2017.
3. Robert T. Futrell , "Quality Software Project Management", Pearson Education India, 2008.
4. Gopalaswamy Ramesh, "Managing Global Software Projects: How to Lead Geographically Distributed Teams, Manage Processes and Use Quality Models", McGraw Hill Education, 2017.
5. Richard H.Thayer "Software Engineering Project Management", 2nd Edition, Wiley, 2006.
6. S. A. Kelkar," Software Project Management" PHI, New Delhi, Third Edition ,2013

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	Pso2	Pso3
CO1	2	1	2	2	2	2	1	2	2
CO2	2	1	2	2	2	2	1	2	2
CO3	2	1	2	2	2	2	1	2	2
CO4	2	1	2	2	2	2	1	2	2
CO5	2	1	2	2	2	2	2	2	2

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PPMC2PE02	PROFESSIONAL ETHICS IN IT	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To understand the concepts of computer ethics in the work environment.
- To understand the threats in computing environment
- To Understand the intricacies of accessibility issues
- To ensure safe exits when designing the software projects

UNIT I: INTRODUCTION TO ETHICS 9

Definition of Ethics- Right, Good, Just- The Rational Basis of Ethics -Theories of Right: Intuitionist vs. End-Based vs. Duty-Based -Rights, Duties, Obligations -Theory of Value - Conflicting Principles and Priorities -The Importance of Integrity -The Difference Between Morals, Ethics, and Laws -Ethics in the Business World - Corporate Social Responsibility - Creating an Ethical Work Environment -Including Ethical Considerations in Decision Making

UNIT II ETHICS IN INFORMATION TECHNOLOGY, INTERNET CRIME 9

IT Professionals - Are IT Workers Professionals- Professional Relationships That Must Be Managed - Professional Codes of Ethics - Professional Organizations - Certification - IT Professional Ethics, Three Codes of Ethics, Management Conflicts. The Reveton Ransomware Attacks -IT Security Incidents: A Major Concern - Why Computer Incidents Are So Prevalent - Types of Exploits -Types of Perpetrators-Federal Laws for Prosecuting Computer AttacksImplementing Trustworthy Computing -Risk Assessment -Establishing a Security Policy - Educating Employees and Contract Workers

UNIT III - FREEDOM OF EXPRESSION, PRIVACY 9

First Amendment Rights -Obscene Speech-Defamation -Freedom of Expression: Key Issues - Controlling Access to Information on the Internet -Strategic Lawsuit Against Public Participation (SLAPP)-Anonymity on the Internet-Hate Speech- Privacy Protection and the Law- Information Privacy- Privacy Laws, Applications, and Court Rulings-Key Privacy and Anonymity IssuesData Breaches -Electronic Discovery-Consumer Profiling- Workplace Monitoring -Advanced Surveillance Technology

UNIT IV - FREEDOM OF EXPRESSION, INTELLECTUAL PROPERTY RIGHTS 9

Intellectual Property Rights-Copyrights-Copyright Term - Eligible Works -Fair Use Doctrine - Software Copyright Protection –Copyright Laws and the internet-Copyright and Piracy–Patents- -Software Patents - Cross-Licensing Agreements -Trade Secrets-Trade Secret Laws -Employees and Trade Secrets-Key Intellectual Property Issues-Plagiarism -Reverse Engineering-Open Source Code- Competitive Intelligence -Trademark Infringement -Cyber squatting

UNIT - V: SOCIAL NETWORKING ETHICS AND ETIQUETTES 9

Social Networking Web Site- Business Applications of Online Social Networking-Social Network Advertising-The Use of Social Networks in the Hiring Process-Social Networking Ethical Issues –Cyber bullying- Online Virtual Worlds-Crime in Virtual Worlds-Educational and Business Uses of Virtual Worlds

TOTAL: 45 PERIODS

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COURSE OUTCOMES:	Blooms Level
CO 1 : Examine situations and to internalize the need for applying ethical principles, values to tackle various situations.	Apply
CO 2 : Develop a responsible attitude towards the use of computers as well as the technology.	Understand
CO 3 : Envision the societal impact on the products/ projects they develop in their career	Create
CO 4 : Understand the code of ethics and standards of computer professionals.	Apply
CO 5 : Analyze professional responsibility and empower access to information in the workplace	Apply

TEXT BOOK

1. Caroline Whitback, "Ethics in Engineering Practice and Research", Cambridge University Press, 2nd Edition 2011.
2. George Reynolds, "Ethics in Information Technology", Cengage Learning, 6thEdition 2018.

REFERENCES:

1. Barger, Robert. (2008). Computer ethics: A case-based approach.Cambridge University Press 1stEdition.
2. John Weckert and Douglas Adeney, Computer and Information Ethics, Greenwood Press,FirstEdition1997.
3. Penny Duquenoy, Simon Jones and Barry G Blundell, "Ethical, legal and professional issues in computing", Middlesex University Press, First Edition2008.
4. Sara Baase, "A Gift of Fire: Social, Legal, and Ethical Issues for Computing Technology", 4th Edition, Pearson India, 2018.

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	Pso2	Pso3
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CO2	2	1	2	2	2	2	1	2	2
CO3	2	1	2	2	2	2	1	2	2
CO4	2	1	2	2	2	2	1	2	2
CO5	2	1	2	2	2	2	2	2	2

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PPMC2PE03	ADVANCES IN OPERATING SYSTEMS	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To review the fundamentals of Operating Systems
- To gain knowledge on Distributed Operating System concepts that includes issues, Mutual exclusion algorithms, Deadlock detection algorithms
- To gain insight on the distributed resource management components viz. the algorithms for implementation of distributed shared memory, and distributed scheduling.
- To know the components and management aspects of Real time, Mobile operating systems
- To acquire knowledge on the basics of Linux and Mobile OS like iOS, Android

UNIT I FUNDAMENTALS OF OPERATING SYSTEMS 9

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Models of Resources - Deadlocks: Detection, Prevention and Recovery

UNIT II DISTRIBUTED OPERATING SYSTEMS 9

Issues in Distributed Operating System – Communication Primitives – Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms

UNIT III - DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File Systems – Design Issues – Distributed Shared Memory – Algorithms for Implementing Distributed Shared Memory – Distributed Scheduling – Issues in Load Distributing – Load Distributing Algorithms

UNIT IV - REAL TIME AND MOBILE OPERATING SYSTEMS 9

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems – Microkernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

UNIT - V: CASE STUDIES 9

Linux System: Design Principles - Kernel Modules - Process Management - Scheduling - Memory Management – Input Output Management - File System – Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

TOTAL: 45 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : Discuss various synchronization, scheduling and deadlock issues	Apply
CO 2 : Demonstrate mutual exclusion and deadlock detection of Distributed Operating system	Understand
CO 3 : Discuss various resource management techniques for distributed systems	Create
CO 4 : Identify the different features of real time and mobile operating systems	Apply
CO 5 : Perform administrative tasks on Linux Servers, iOS and Android	Apply

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TEXT BOOK

- Mukesh Singhal, Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill,First Edition, 1994.
- Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System ConceptsEssentials", Ninth Edition, John Wiley & Sons, 2013.

REFERENCES:

- Love Robert," Linux Kernel Development", Pearson Education India, Third Edition, 2018.
- Neil Smyth, "iOS 12 App Development Essentials", Payload media, 2018.
- Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, First Edition 2006.

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	Pso2	Pso3
CO1	2	1	2	2	2	2	1	2	2
CO2	2	1	2	2	2	2	1	2	2
CO3	2	1	2	2	2	2	1	2	2
CO4	2	1	2	2	2	2	1	2	2
CO5	2	1	2	2	2	2	2	2	2

S.C

PPMC1PE04	INFORMATION RETRIEVAL TECHNIQUES	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search
- To understand the concepts of digital libraries

UNIT I: MOTIVATION 9

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics– The impact of the web on IR —IR Versus Web Search–Components of a Search engine

UNIT II MODELING 9

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing

UNIT III - INDEXING 9

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching-Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT IV - CLASSIFICATION AND CLUSTERING 9

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering – Matrix decompositions and latent semantic indexing – Fusion and Meta learning

UNIT - V: SEARCHING THE WEB AND RETRIEVAL 9

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

TOTAL: 45 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : Build an Information Retrieval system using the available tools.	Apply
CO 2 : Identify and design the various components of an Information Retrieval system.	Understand
CO 3 : Model an information retrieval system	Create
CO 4 : Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.	Apply
CO 5 : Design an efficient search engine and analyze the Web content structure..	Apply

TEXT BOOK

1. Abraham Silberschatz, Henry F Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2019.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education/Addison Wesley, 2017.

REFERENCES:

- Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, First Edition2010.
- Manning D. Christopher, Raghavan Prabhakar & Schutz Hinrich, " Introduction to Information Retrieval", Cambridge University Press, Online Edition,2009.
- David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms and Heuristics", Springer, 2nd Edition, 2004.
- Bruce Croft, Donald Metzler,Trevor Strohman, "Search Engines: Information Retrieval in Practice", Pearson, 2009.
- Ricardo Baeza – Yates, BerthierRibeiro – Neto, —Modern Information Retrieval: The concepts and Technology behind Search‖ (ACM Press Books), Second Edition, 2011.
- 6. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines (The MIT Press), Illustrated Edition, 2016.

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	Pso2	Pso3
CO1	2	1	2	2	2	2	1	2	2
CO2	2	1	2	2	2	2	1	2	2
CO3	2	1	2	2	2	2	1	2	2
CO4	2	1	2	2	2	2	1	2	2
CO5	2	1	2	2	2	2	2	2	2

S-CM

PPMC2PE05	WIRELESS NETWORKING	L T P C
		3 0 0 3

COURSE OBJECTIVE

- The student should be made:
- To understand the concept about Wireless networks, protocol stack and standards
- To understand and analyse the network layer solutions for Wireless networks
- To study about fundamentals of 3G Services, its protocols and applications
- To learn about evolution of 4G Networks, its architecture and applications
- To explore the architecture of 5G, 5G Modulation Schemes and to analyse the concept of MIMO and other research areas in 5G

UNIT I: WIRELESS LAN 9

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum, IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, WirelessHART-IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

UNIT II MOBILE NETWORK LAYER 9

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: 73 Routing: Destination-Sequenced Distance-Vector (DSDV), Dynamic source routing, IoT: CoAP. TCP enhancements for wireless protocols

UNIT III - 3G OVERVIEW 9

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, 3GPP Architecture, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TDCDMA, TD – SCDMA

UNIT IV - 4G NETWORKS 9

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Cognitive Radio, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

UNIT - V: 5G NETWORKS 9

Introduction to 5G, vision and challenges, 5G NR – New Radio – air interface of 5G, radio access, Ultra-Dense Network Architecture and Technologies for 5G- Generalized frequency division multicarrier (GFDM)- Principles, Transceiver Block diagram-MIMO in LTE, Theoretical background, Single user MIMO, Multi-user MIMO, Capacity of massive MIMO: a summary, Basic forms of massive MIMO implementation.

TOTAL:45 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : Select a wireless network environment for an application based on factors like distance etc	Apply
CO 2 : Implement Packet Delivery from source to destination in a mobile network	Understand
CO 3: Select 3G wireless technology and protocol based on the requirement	Create
CO 4 : Understand various 4G networking technologies and their unique functionalities	Apply
CO 5 : Get an overview of the implementation latest network Architecture , its principles and evolution	Apply

TEXT BOOK

- Jochen Schiller, Mobile Communications, Second Edition, Pearson Education 2012
- Vijay Garg, —Wireless Communications and networking‖, First Edition, Elsevier 2007.

REFERENCES:

- AfifOsseiran, Jose.F.Monserrat and Patrick Marsch, "5G Mobile and Wireless 74 Communications Technology", Cambridge University Press, First Edition2016.
- Anurag Kumar, D.Manjunath, Joy kuri, —Wireless Networking, First Edition, Elsevier 2011.
- Xiang, W; Zheng, K; Shen, X.S; "5G Mobile Communications", Springer, First Edition2016
- Saad Z Asif, "5G Mobile Communication,Concepts and Challenges", First EditionCRC Press
- 7. Thomas L. Marzetta, Erik G. Larsson, Hong Yang,HienQuoc Ngo, "Fundamentals of Massive MIMO", Cambridge University Press, First Edition2018

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	Pso2	Pso3
CO1	2	1	2	2	2	2	1	2	2
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CO3	2	1	2	2	2	2	1	2	2
CO4	2	1	2	2	2	2	1	2	2
CO5	2	1	2	2	2	2	2	2	2

PPMC1PE06	SOFT COMPUTING TECHNIQUES	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To gain knowledge of soft computing theories and its fundamentals.
- To design a soft computing system required to address a computational task. 52
- To learn and apply artificial neural networks, fuzzy sets and fuzzy logic and genetic algorithms in problem solving and use of heuristics based on human experience.
- To introduce the ideas of fuzzy sets, fuzzy logic and to become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- To familiarize with genetic algorithms and other random search procedures while seeking global optimum in self – learning situations.

UNIT I: FUZZY COMPUTING 9

Basic Concepts of Fuzzy Logic, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversion Membership Functions, Interference in Fuzzy Logic, Fuzzy If – Then Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzification and Defuzzification, Fuzzy Controller, Industrial Applications

UNIT II FUNDAMENTALS OF NEURAL NETWORKS 9

Neuron, Nerve Structure and Synapse, Artificial Neuron and its Model, Activation Functions, Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks, Recurrent Networks. Various Learning Techniques; Perception and Convergence Rule, Auto-Associative and Hetero-Associative Memory

UNIT III - BACKPROPAGATION NETWORKS 9 9

Back Propagation Networks) Architecture: Perceptron Model, Solution, Single Layer Artificial Neural Network, Multilayer Perceptron Model; Back Propagation Learning Methods, Effect of Learning Rule Co – Efficient ;Back Propagation Algorithm, Factors Affecting Backpropagation Training, Applications

UNIT IV - COMPETITIVE NEURAL NETWORKS 9

Kohenen's Self Organizing Map – SOM Architecture, learning procedure – Application; Learning Vector Quantization – learning by LVQ; Adaptive Resonance Theory – Learning procedure – Applications..

UNIT - V: GENETIC ALGORITHM 9

Basic Concepts, Working Principle, Procedures of GA, Flow Chart of GA, Genetic Representations, (Encoding) Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Applications

TOTAL: 75 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : Identify and describe soft computing techniques and their roles in building intelligent 53 machines.	Apply
CO 2: Recognize the feasibility of applying a soft computing methodology for a particular problem.	Understand
CO 3: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.	Create
CO 4: Apply genetic algorithms to optimization problems.	Apply
CO 5 : Design neural networks to pattern classification and regression problems using a soft computing approach.	Apply

TEXT BOOK

1. J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro – Fuzzy and Soft Computing", Pearson Education, 2004.
2. S. Rajasekaran and G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Systems and Evolutionary Algorithms: Synthesis and Applications", PHI Learning, 2nd Edition, 2017.

REFERENCES:

1. S. N. Sivanandam, S. N. Deepa, "Principles of Soft Computing", Third Edition, Wiley, 2018.
2. Simon Haykin, "Neural Networks and Learning Machines", Pearson, 3rd Edition, 2009.
3. 5. Timothy Ross, "Fuzzy Logic with Engineering Applications", Wiley Publications, 4 th Edition 2016.

CO – PO Mapping

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CO1	2	1	2	2	2	2	1	2	2
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CO3	2	1	2	2	2	2	1	2	2
CO4	2	1	2	2	2	2	1	2	2
CO5	2	1	2	2	2	2	2	2	2

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PPMC2PE07	CYBER SECURITY	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To learn the principles of cyber security and to identify threats and risks.
- To learn how to secure physical assets and develop system security controls.
- To understand how to apply security for Business applications and Network Communications.
- To learn the technical means to achieve security.
- To learn to monitor and audit security measures.

UNIT I: PLANNING FOR CYBER SECURITY 9

Best Practices-Standards and a plan of Action-Security Governance Principles, components and Approach-Information Risk Management-Asset Identification-Threat Identification-Vulnerability Identification-Risk Assessment Approaches-Likelihood and Impact Assessment-Risk Determination, Evaluation and Treatment-Security Management Function-Security Policy-Acceptable Use PolicySecurity Management Best Practices - Security Models: Bell La Padula model, Biba Integrity Model - Chinese Wall model

UNIT II SECURITY CONTROLS 9

People Management-Human Resource Security-Security Awareness and Education-Information Management- Information Classification and handling-Privacy-Documents and Record ManagementPhysical Asset Management-Office Equipment-Industrial Control Systems-Mobile Device SecuritySystem Development-Incorporating Security into SDLC - Disaster management and Incident response planning.

UNIT III - CYBER SECURITY FOR BUSINESS APPLICATIONS AND NETWORKS 9

Business Application Management-Corporate Business Application Security-End user Developed Applications-System Access- Authentication Mechanisms-Access Control-System ManagementVirtual Servers-Network Storage Systems-Network Management Concepts-Firewall-IP SecurityElectronic Communications - Case study on OWASP vulnerabilities using OWASP ZAP tool.

UNIT IV - TECHNICAL SECURITY 9

Supply Chain Management-Cloud Security-Security Architecture-Malware Protection-Intrusion Detection-Digital Rights Management-Cryptographic Techniques-Threat and Incident ManagementVulnerability Management-Security Event Management-Forensic Investigations-Local Environment Management-Business Continuity.

UNIT - V: SECURITY ASSESSMENT 9

Security Monitoring and Improvement-Security Audit-Security Performance-Information Risk Reporting-Information Security Compliance Monitoring-Security Monitoring and Improvement Best 32 Practices

TOTAL: 45 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : Develop a set of risk and security requirements to ensure that there are no gaps in an organization's security practices.	Apply
CO 2 : Achieve management, operational and technical means for effective cyber security.	Understand
CO 3 : Audit and monitor the performance of cyber security controls.	Create
CO 4 : Spot gaps in the system and devise improvements.	Apply
CO 5 : Identify and report vulnerabilities in the system.	Apply

TEXT BOOK

1. William Stallings, "Effective Cyber Security - A guide to using Best Practices and Standards", Addison-Wesley Professional, First Edition, 2019.
2. Adam Shostack, "Threat Modelling - Designing for Security", Wiley Publications, First Edition, 2014.

REFERENCES:

1. Gregory J. Touhill and C. Joseph Touhill, "Cyber Security for Executives - A Practical Guide", Wiley Publications, First Edition, 2014.
2. Raef Meeuwisse, "Cyber Security for Beginners", Second Edition, Cyber Simplicity Ltd, 2017.
3. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", 2nd Edition, Syngress, 2013.
4. 6. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, 2015.

CO – PO Mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	Pso2	Pso3
CO1	2	1	2	2	2	2	1	2	2
CO2	2	1	2	2	2	2	1	2	2
CO3	2	1	2	2	2	2	1	2	2
CO4	2	1	2	2	2	2	1	2	2
CO5	2	1	2	2	2	2	2	2	2

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PPMC2PE08	DIGITAL IMAGE PROCESSING	L T P C
		3 0 0 3

COURSE OBJECTIVE

- Learn digital image fundamentals.
- Be exposed to simple image processing techniques.
- Learn to represent image enhancement in the spatial and frequency domain.
- Be familiar with image segmentation and compression techniques

UNIT I: DIGITAL IMAGE FUNDAMENTALS 9

Elements of visual perception, Image Acquisition Systems, Sampling and Quantization, Image Formation, Image Geometry, Different types of digital images. Relationship between pixels, Basic concepts of distance transform, Color Image fundamentals-RGB-HIS Models, Different color models-conversion.

UNIT II IMAGE TRANSFORMS 9

1D Discrete Fourier Transform (DFT), 2D transforms – DFT, Discrete Cosine Transform, Walsh and PCA

UNIT III - IMAGE ENHANCEMENT 9

Gray Level transformations, Histogram Equalization, Spatial Domain: Basics of Spatial Filtering: smoothing and sharpening spatial filters. Frequency domain: smoothing and sharpening frequency domain filters, Ideal, Gaussian filters.

UNIT IV -IMAGE SEGMENTATION AND FEATURE EXTRACTION 9

Segmentation: Point detection, line detection, edge detection, Region based segmentation, Region Splitting and Merging Technique. Thresholding Techniques: multilevel thresholding, optimal thresholding using Bayesian classification. Feature Extraction: GLCM, Hough Transform, 61 Morphological operation.

UNIT - V: IMAGE COMPRESSION 9

Lossy and lossless compression schemes, prediction based compression schemes, sub-band encoding schemes, JPEG compression standard, Fractal compression scheme, Wavelet compression scheme

TOTAL: 45 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : digitize the input image using appropriate sampling and quantizing techniques	Apply
CO 2 : Transform the input images to various domains and classify the images	Understand
CO 3 : enhance the images using spatial domain and frequency domain for better visual representation	Create
CO 4 : To extract the features of a image by applying Morphological Image Processing techniques.	Apply
CO 5: Analyze the different image compression techniques and its significance	Apply

TEXT BOOK

3. Abraham Silberschatz, Henry F Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2019.
4. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education/Addison Wesley, 2017.

REFERENCES:

- Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", 4th Edition, Pearson Education, New Delhi, 2018
- Jain Anil K.,"Fundamentals of Digital Image Processing", 1st Edition, Prentice Hall of India, New Delhi, 2002.
- Kenneth R.Castleman, "Digital Image Processing", 1 st Edition, Prentice Hall of India, New Delhi, 2006.
- John C.Russ, "The Image Processing Handbook", 5thEdition, Prentice Hall, New Jersey, 2002.
- Willliam K Pratt, "Digital Image Processing", 3rd Edition, John Willey,2002.
- 6. Dr.S.Sridhar, Digital Image Processing, Second Edition, Oxford University Press, 2016

CO – PO Mapping

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CO2	2	1	2	2	2	2	1	2	2
CO3	2	1	2	2	2	2	1	2	2
CO4	2	1	2	2	2	2	1	2	2
CO5	2	1	2	2	2	2	2	2	2

PPMC2PE09	DATA MINING AND DATA WAREHOUSING TECHNIQUES	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To characterize the kinds of patterns that can be discovered by association rule mining.
- To implement classification techniques on large datasets.
- To analyse various clustering techniques in real world applications.
- To get exposed to the concepts of data warehousing architecture and implementation

UNIT I: DATA MINING & DATA PREPROCESSING 9

Data Mining– Concepts , DBMS vs Data mining , kinds of Data, Applications, Issues and Challenges– Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT II ASSOCIATION RULE MINING AND CLASSIFICATION 9

Introduction to Association rules – Association Rule Mining – Mining Frequent Itemsets with and without Candidate Generation –Classification versus Prediction – Data Preparation for Classification and Prediction

UNIT III - CLASSIFICATION AND PREDICTION TECHNIQUES 9

9 Classification by Decision Tree – Bayesian Classification – Rule Based Classification – Bayesian Belief Networks – Classification by Backpropagation – Support Vector Machines – K-Nearest Neighbor Algorithm – Linear Regression, Nonlinear Regression

UNIT IV - CLUSTERING TECHNIQUES 9

Cluster Analysis – Partitioning Methods: k-Means and k- Medoids – Hierarchical Methods: Agglomerative and Divisive –Model Based Clustering Methods: Fuzzy clusters and ExpectationMaximization Algorithm

UNIT - V: DATA WAREHOUSE 9

Need for Data Warehouse – Database versus Data Warehouse – Multidimensional Data Model – Schemas for Multidimensional Databases – OLAP operations – OLAP versus OLTP – Data Warehouse Architecture – Extraction, Transformation and Loading (ETL)

TOTAL: 45 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : Identify data mining techniques in building intelligent model.	Apply
CO 2 : Illustrate association mining techniques on transactional databases.	Understand
CO 3 : Apply classification and clustering techniques in real world applications.	Create
CO 4: Evaluate various mining techniques on complex data objects.	Apply
CO 5 : Design, create and maintain data warehouses	Apply

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TEXT BOOK

- Jiawei Han, Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
- 2. K. P. Soman, Shyam Diwakar, V. Ajay, "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2009.

REFERENCES:

- 3. Data Warehousing, Data Mining, & OLAP – Alex Berson, Stephen Smith, TMHill,2008.
- 4. David L. Olson Dursun Delen, "Advanced Data Mining Techniques," Springer-Verlag Berlin Heidelberg, 2008
- 5. G. K. Gupta, "Introduction to Data Min Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, Third Edition, 2014

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CO3	2	1	2	2	2	2	1	2	2
CO4	2	1	2	2	2	2	1	2	2
CO5	2	1	2	2	2	2	2	2	2

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PPMC2PE0	SOFTWARE ARCHITECTURE	L T P C
		3 0 0 3

COURSE OBJECTIVE

- Understand software architectural requirements and drivers
- Be exposed to architectural styles and views
- Be familiar with architectures for emerging technologies

UNIT I: INTRODUCTION AND ARCHITECTURAL DRIVERS 9

Introduction – Software architecture - Architectural structures – Influence of software architecture on organization - both business and technical – Architecture Business Cycle- Functional requirements – Technical constraints – Quality Attributes

UNIT II :QUALITY ATTRIBUTE WORKSHOP 9

Quality Attribute Workshop – Documenting Quality Attributes – Six part scenarios – Case studies.

UNIT III - ARCHITECTURAL VIEWS 9

Introduction – Standard Definitions for views – Structures and views – Representing viewsavailable notations – Standard views – 4+1 view of RUP, Siemens 4 views, SEI's perspectives and views – Case studies

UNIT IV- ARCHITECTURAL STYLES 9

Introduction – Data flow styles – Call-return styles – Shared Information styles – Event styles – Case studies for each style

UNIT - V: DOCUMENTING THE ARCHITECTURE 9

Good practices – Documenting the Views using UML – Merits and Demerits of using visual languages – Need for formal languages – Architectural Description Languages – ACME – Case studies. Special topics: SOA and Web services – Cloud Computing – Adaptive structures

TOTAL: 75 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : Explain influence of software architecture on business and technical activities	Apply
CO 2 : Summarize quality attribute workshop	Understand
CO 3 : Identify key architectural structures	Create
CO 4 : Use styles and views to specify architecture	Apply
CO 5 : Design document for a given architecture	Apply

TEXT BOOK

1. Len Bass, Paul Clements, and Rick Kazman, "Software Architectures Principles and Practices", 2n Edition, Addison-Wesley, 2003.
2. Anthony J Lattanze, "Architecting Software Intensive System. A Practitioner's Guide", 1st Edition, Auerbach Publications, 2010.

REFERENCES:

1. Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord, and Judith Stafford, "Documenting Software Architectures. Views and Beyond", 2ndEdition, Addison-Wesley, 2010
2. Paul Clements, Rick Kazman, and Mark Klein, "Evaluating software architectures: Methods and case studies.",1st Edition, Addison-Wesley, 2001.
3. Mark Hansen, "SOA Using Java Web Services", 1st Edition, Prentice Hall, 2007
4. David Garlan, Bradley Schmerl, and Shang-Wen Cheng, "Software Architecture-Based SelfAdaptation," 31-56. Mieso K Denko, Laurence Tianruo Yang, and Yan Zang (eds.), "Autonomic Computing and Networking".1st Edition, Springer Verlag 2009.

CO – PO Mapping

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CO3	2	1	2	2	2	2
CO4	2	1	2	2	2	2
CO5	2	3	2	2	2	2

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PPMC2PE11	AGILE METHODOLOGIES	L T P C
		3 0 0 3

COURSE OBJECTIVE

- 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.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing

UNIT I: AGILE FUNDAMENTAL 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 –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 Modeling and 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 - Agile Approach in Global Software Development - Agile Scrum - Scrum Master – Scaling Projects using Scrum

TOTAL: 45 PERIODS

COURSE OUTCOMES:	Blooms Level
CO 1 : Realize the importance of interacting with business stakeholders in determining the requirements for a software system	Apply
CO 1 : Perform iterative software development processes: how to plan them, how to execute them.	Understand
CO 1 : Point out the impact of social aspects on software development success.	Create
CO 1 : Develop techniques and tools for improving team collaboration and software quality.	Apply
CO 1 : Show how agile approaches can be scaled up to the enterprise level	Apply

TEXT BOOK

1. David J. Anderson and Eli Schragenheim,, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Illustrated Edition, Prentice Hall PTR, 2004
2. Orit Hazza and Yaepl Dubinsky, "Agile Software Engineering,: Undergraduate Topics in Computer Science, Springer Verlag, First Edition,2009

REFERENCES:

1. Craig Larman, "Agile and Iterative Development: A Manager's Guide", Pearson Education, Second Impression, 2007
2. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Elsevier, Butterworth-Heinemann, FirstEdition,2007
3. Ken Schwaber, "Agile Project Management with Scrum", Illustrated, Revised Edition Microsoft Press, 2004
4. Konnor Cluster, "Agile Project Management: Learn How To Manage a Project With Agile Methods, Scrum, Kanban and Extreme Programming", Independently Published,FirstEdition,2019

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CO5	2	1	2	2	2	2	2	2	2

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PPMC1BC01	DATA STRUCTURES AND ALGORITHMS	L T P C
		3 0 2 4

COURSE OBJECTIVE

- Be familiar with basic techniques of algorithm analysis.
- Be exposed to the concept of ADTs.
- Learn linear data structures-List, Stack and Queue.
- Learn nonlinear data structures-Tree and Graphs.
- Be exposed to sorting, searching and hashing algorithms

UNITI: INTRODUCTION 9+6

Introduction - Abstract Data Types (ADT) – Arrays and its representation –Structures – Fundamentals of algorithmic problem solving – Important problem types – Fundamentals of the analysis of algorithm – analysis framework – Asymptotic notations, Properties, Recurrence Relation.

Lab Experiments:

1. Develop a program to perform various array operations
2. Write a program to find running time complexity by considering each statement in the program for a given set of numbers.

UNITII LINEAR DATA STRUCTURES - STACK, QUEUE 9+6

Stack ADT – Operations on Stack - Applications of stack – Infix to postfix conversion – evaluation of expression - Queue ADT – Operations on Queue - Circular Queue - Applications of Queue.

Lab Experiments:

1. Write a program to convert infix to postfix using stack data structure
2. Develop a program to perform circular queue operations

UNITIII - LINEAR DATA STRUCTURES – LIST
9+6

List ADT - Array-based Implementation - Linked list implementation - Singly Linked Lists – Circularly linked lists – Doubly Linked Lists - Applications of linked list – Polynomial Addition.

Lab Experiments:

1. Perform Polynomial Manipulation using Single Linked List.
2. Implement the various operations in double linked list.

UNITIV - SEARCHING, SORTING AND HASH TECHNIQUES 9+6

Searching: Linear search – Binary Search- comparison of linear search and binary search, Sorting algorithms: Insertion sort - Bubble sort – selection sort - Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing.

Lab Experiments:

1. Write a program to perform binary search
2. Write a program to sort a given set of numbers and compare among Bubble Sort, Selection Sort and Insertion Sort with respect to computational complexity.

UNIT -V: NON LINEAR DATA STRUCTURES - TREES AND GRAPHS9+6

Trees and its representation – left child right sibling data structures for general trees- Binary Tree – Binarytree traversals –- Binary Search Tree - Graphs and its representation - Graph Traversals - Depth-first traversal – breadth-first traversal-Application of graphs.

Lab Experiments:

1. Write a program to delete a node from a given Binary search tree
2. Write a program to perform Graph Traversals

TOTAL:75PERIODS

COURSEOUTCOMES:	Blooms Level
CO 1 : Analyze algorithms and determines their time complexity.	Analyze
CO 2 : Understand the concepts of data types, data structures and linear structures	Understand
CO 3 : Apply data structures to solve various problems	Apply
CO 4 : Apply different sorting, searching and hashing algorithms.	Apply
CO 5 : Understand non-linear data structures	Understand

TEXT BOOK

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, India, 2016
2. Jean Paul Tremblay and Paul G. Sorensen, "An Introduction to Data Structures with Applications", 2nd Edition, Tata McGraw Hill, New Delhi, 2017.

REFERENCES:

1. Levitin "Introduction to the Design and Analysis of Algorithms" 3rd Edition, Pearson Education
2. A.K. Sharma, "Data Structures using C", 2nd Edition, Pearson Education Asia, 2013
3. E. Horowitz, Anderson-Freed and S.Sahni, "Fundamentals of Data structures in C", 2 ndEdition,University Press, 2007
4. E.Balagursamy," Data Structures using C", Tata McGraw Hill 2015 Reprint

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PPMC1BC02	PROBLEM SOLVING AND PROGRAMMING IN C	L T P C
		3 0 2 4

COURSE OBJECTIVE

- To understand the basic concepts of problem solving approaches and to develop the algorithms
- Apply the techniques of structured (functional) decomposition to break a program into smaller pieces and describe the mechanics of parameter passing.
- To design, implements, test, and apply the basic C programming concepts

UNITI: INTRODUCTION TO COMPUTER PROBLEM SOLVING 9

Introduction – The Problem Solving aspect – Top down design – Implementation of algorithm – Program Verification – The efficiency of algorithms – The analysis of algorithms – Fundamental Algorithms

UNITII PROGRAMMING AND ALGORITHMS 9

Programs and Programming – building blocks for simple programs -pseudo code representation – flow charts - Programming Languages - compiler –Interpreter, Loader and Linker - Program execution – Classification of Programming Language - Structured Programming Concept – Illustrated Problems: Algorithm to check whether a given number is Armstrong numberor not- Find factorial of a number

UNITIII - BASICS OF 'C', INPUT / OUTPUT & CONTROL STATEMENTS 9+10

Introduction- Identifier – Keywords - Variables – Constants – I/O Statements - Operators - Initialization – Expressions – Expression Evaluation – Lvalues and Rvalues – Type Conversion in C –Formatted input and output functions - Specifying Test Condition for Selection and Iteration- Conditional Execution - and Selection – Iteration and Repetitive Execution- go to Statement – Nested Loops- Continue and break statements.

Lab Experiments:

1. Write programs to get some input , perform some operation and display the output using I/O statements

2. Write a program to execute some specific statements based on the test condition

3. Write programs to implement nested loop

UNITIV - ARRAYS, STRINGS, FUNCTIONS AND POINTERS 9+10

Searching: Linear search – Binary Search- comparison of linear search and binary search, Sorting algorithms: Insertion sort - Bubble sort – selection sort - Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing.

Lab Experiments:

1. Write a program to perform binary search

2. Write a program to sort a given set of numbers and compare among Bubble Sort, Selection Sort and Insertion Sort with respect to computational complexity.

UNIT -V: USER-DEFINED DATATYPES & FILES9+6

Structures – initialization - nested structures – structures and arrays – structures and pointers - union– type def and enumeration types - bit fields - File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

Lab Experiments:

1. Write a C program to Store Student Information in Structure and Display it.
2. The annual examination is conducted for 10 students for five subjects.
3. Write a program to read the data from a file and determine the following: Total marks obtained by each student; Topper of the class

TOTAL:75PERIODS

COURSEOUTCOMES:

CO 1 : Able to design a computational solution for a given problem.

CO 2 : Able to break a problem into logical modules that can be solved (programmed).

CO 3 : Able to transform a problem solution into programs involving programming constructs.

CO 4 : To write programs using structures, strings, arrays, pointers and files for solving complex computational problems.

CO 5 : Able to introduce modularity using functions and pointers which permit ad hoc runtime polymorphism

TEXT BOOK

1. Deitel and Deitel, "C How to Program", Pearson Education. 2013, 7th Edition
2. Brian W. Kernighan and Dennis M. Ritchie, "The C programming Language", Edition? 2nd edition 2015, Pearson Education India

REFERENCES:

1. How to solve it by Computer, R. G. Dromey, Pearson education, Fifth Edition, 2007
2. Kamthane, A.N., "Programming with ANSI and Turbo C", Pearson Education, Delhi, 3rdEdition, 2015
3. PradipDey, ManasGhosh, —Computer Fundamentals and Programming in C, Second Edition, Oxford University Press, 2013.

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