MUTHAYAMMAL ENGINEERING COLLEGE

An Autonomous Institution

(Approved by AICTE | Accredited by NBA & NAAC | Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

Curriculum/Syllabus

Programme Code : MC

Programme Name : Master of Computer Applications

Regulation : R-2023

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

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DESIGNING YOUR FUTURE
Estd. 2000

Institution Vision & Mission

Institution Vision

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

Institution Mission

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

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Department Vision & Mission

Department Vision

- To produce the Computer Applications students with the Innovative and Entrepreneur skills to face the challenges ahead.

Department Mission

- To impart knowledge in the state of art technologies in Computer Applications.
- To inculcate the analytical and logical skills in the field of Computer Applications through programming.
- To produce the graduates as software professionals, higher study, research activities with ethical values.

Program Educational Objectives

PEO1 : Graduates should be able to exercise technical expertise,excel in communication skills and leadership to manage diverse audience in their career.

PEO2 : Graduates should employ technical skills to solve societal environmental issues in an ethical manner.

PEO3 : Graduates should be able to involve in learning the emerging technologies to meet the global demands.

Program Specific Outcomes

PSO1 : Apply software engineering principles in the design and development

PSO2 : Manage and analyze big data in real time applications

PSO3 : Graduates should be able to involve in learning the emerging technologies to meet the global demands.

Program Outcomes

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

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

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

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

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

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

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

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

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

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

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

PO12 : **Lifelong learning:** Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

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Master of Computer Applications

Grouping of Courses

Sl.No.	Course Code	CourseTitle	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
I. Foundation Course(FC)								
1.	23MCA01	Discrete Mathematics	FC	4	3	1	0	4
II. Professional Core(PC)								
1.	23MCB01	Digital Principles	PC	3	3	0	0	3
2.	23MCB02	Data Structures using C	PC	4	3	1	0	4
3.	23MCB03	Relational Database Management Systems	PC	3	3	0	0	3
4.	23MCB04	Problem Solving and Python Programming	PC	4	3	1	0	4
5.	23MCB05	Operating Systems	PC	4	3	1	0	4
6.	23MCB06	Data Structures and Algorithms Laboratory	PC	4	0	0	4	2
7.	23MCB07	Relational Database Management Systems Laboratory	PC	4	0	0	4	2
8.	23MCB08	Python Programming Laboratory	PC	4	0	0	4	2
9.	23MCB09	Data Communication and Networks	PC	3	3	0	0	3
10.	23MCB10	Software Engineering	PC	3	3	0	0	3
11.	23MCB11	Internet and Java Programming	PC	3	3	0	0	3
12.	23MCB12	Object Oriented Analysis and Design	PC	3	3	0	0	3
13.	23MCB13	Big Data Analytics	PC	4	0	0	4	2
14.	23MCB14	Internet Programming Laboratory	PC	4	0	0	4	2
15.	23MCB15	Software Development Laboratory–Case Tools Lab	PC	4	0	0	4	2
16.	23MCB16	Data Analytics Laboratory	PC	3	3	0	0	3
17.	23MCB17	Mobile Computing	PC	3	3	0	0	3
18.	23MCB18	Network Programming	PC	4	0	0	4	2
19.	23MCB19	Mobile Application Development Laboratory	PC	4	0	0	4	2
20.	23MCB20	Network Programming Laboratory	PC	3	3	0	0	3
21.	23MCB21	Information Technology	PC	4	0	0	4	2
22.	23MCB22	Data Processing Laboratory	PC	4	0	0	4	2
23.	23MCB23	Public Speaking and Skill Development Laboratory	PC	4	0	0	4	2

III. Professional Electives(PE)								
1.	23MCC01	Software Project Management	PE	3	3	0	0	3
2.	23MCC02	Web Technologies	PE	3	3	0	0	3
3.	23MCC03	E-Learning	PE	3	3	0	0	3
4.	23MCC04	Software Quality and Testing	PE	3	3	0	0	3
5.	23MCC05	Advances in Operating Systems	PE	3	3	0	0	3
6.	23MCC06	Cyber Security	PE	3	3	0	0	3
7.	23MCC07	C# and .Net Programming	PE	3	3	0	0	3
8.	23MCC08	Wireless Networking	PE	3	3	0	0	3
9.	23MCC09	Web Design	PE	3	3	0	0	3
10.	23MCC10	Network Programming and Security	PE	3	3	0	0	3
11.	23MCC11	Cloud Computing Technologies	PE	3	3	0	0	3
12.	23MCC12	Bio Inspired Computing	PE	3	3	0	0	3
13.	23MCC13	Information Retrieval Techniques	PE	3	3	0	0	3
14.	23MCC14	Software Architecture	PE	3	3	0	0	3
15.	23MCC15	Digital Forensics	PE	3	3	0	0	3
16.	23MCC16	Data Mining and Data Warehousing	PE	3	3	0	0	3
17.	23MCC17	Operations Research	PE	3	3	0	0	3
18.	23MCC18	Professional Ethics in IT	PE	3	3	0	0	3
19.	23MCC19	Marketing Management	PE	3	3	0	0	3
20.	23MCC20	Organizational Behavior	PE	3	3	0	0	3
21.	23MCC21	Software Testing and Quality Assurance	PE	3	3	0	0	3
22.	23MCC22	Advances in Networking	PE	3	3	0	0	3
23.	23MCC23	Soft Computing Techniques	PE	3	3	0	0	3
24.	23MCC24	Deep Learning	PE	3	3	0	0	3
25.	23MCC25	Big Data Processing	PE	3	3	0	0	3
26.	23MCC26	Artificial Intelligence	PE	3	3	0	0	3

IV. Employability Enhancement Courses (EEC)								
Sl.No.	**Course Code**	**CourseTitle**	**Category**	**Contact Hours**	**Instruction Hours/Week/ Credit**			
					L	**T**	**P**	**C**
1	23MCD01	Project Work	EEC	24	0	0	24	12

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Master of Computer Applications
Curriculum |PG - R2023
Semester -I

Sl.No.	Course Code	CourseTitle	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Theory								
1.	23MCA01	Discrete Mathematics	FC	4	3	1	0	4
2.	23MCB01	Digital Principles	PC	3	3	0	0	3
3.	23MCB02	DataStructures Using C	PC	4	3	1	0	4
4.	23MCB21	Information Technology	PC	3	3	0	0	3
5.	23MCB04	Problem Solving and Python Programming	PC	4	3	1	0	4
6.	23MCB05	OperatingSystems	PC	4	3	1	0	4
Practical								
7.	23MCB22	DataProcessing Lab	PC	4	0	0	4	2
8.	23MCB23	Public Speaking and Skill Development Lab	PC	4	0	0	4	2
							Total Credit	**26**

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Curriculum | PG - R2023
Semester -II

Sl.No.	Course Code	CourseTitle	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Theory								
1.	23MCB09	Data Communication and Networks	PC	3	3	0	0	3
2.	23MCB10	Software Engineering	PC	3	3	0	0	3
3.	23MCB11	Internet and Java Programming	PC	3	3	0	0	3
4.	23MCB12	Object Oriented Analysis and Design	PC	3	3	0	0	3
5.	23MCB13	Big Data Analytics	PC	3	3	0	0	3
6.		**Elective I**		3	3	0	0	3
Practical								
7.	23MCB14	Internet Programming Laboratory	PC	4	0	0	4	2
8.	23MCB15	Software Development-CASE Tools Laboratory	PC	4	0	0	4	2
9.	23MCB16	Data Analytics Laboratory	PC	4	0	0	4	2
							Total Credit	**24**

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MasterofComputerApplications
Curriculum | PG - R2023
Semester -III

Sl.No.	Course Code	CourseTitle	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Theory								
1.	23MCB17	Mobile Computing	PC	3	3	0	0	3
2.	23MCB18	Network Programming	PC	3	3	0	0	3
3.		**Elective II**	PE	3	3	0	0	3
4.		**Elective III**	PE	3	3	0	0	3
5.		**Elective IV**	PE	3	3	0	0	3
6.		**Elective V**	PE	3	3	0	0	3
Practical								
7.	23MCB19	Mobile Application Development Lab	PC	4	0	4	2	4
8.	23MCB20	Network Programming Lab	PC	4	0	4	2	4
							Total Credit	**22**

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Master of Computer Applications
Curriculum | PG - R2023
Semester -IV

Sl.No	Course Code	CourseTitle	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Practical								
1.	23MCD01	Project Work	EEC	12	0	0	24	12
							Total Credit	**24**

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Summary of Course Component

Sl No.	Course Area	Semesters				Total Credits	% of Credits
		I	II	III	IV		
1	FC	4	-	-	-	4	5
2	PC	22	21	10	-	53	63
3	PE	0	3	12	-	15	18
4	EEC	0	0	0	12	12	14
TOTAL		26	24	22	12	**84**	**100**

23MCA01	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

Course Objective:

- To extend student's Logical and Mathematical maturity.
- To deal with abstraction and the counting principles.
- To identify the basic properties of graphs and model simple applications.
- To study the concepts and properties of algebraic structures.
- To learn discrete objects and their properties

Course Outcomes:

23MCA01.CO1	Have knowledge of the concepts needed to test the logic of a program.
23MCA01.CO2	Ability to distinguish between the notion of discrete and continuous mathematical structures.
23MCA01.CO3	Have an understanding in identifying structures on many levels.
23MCA01.CO4	Be aware of the counting principles.
23MCA01.CO5	Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCA01.CO1	X	X	-	-	-	-	-	-	-	-	-	X	-	X	-
23MCA01.CO2	X	X	X	-	-	-	-	-	-	-	-	X	-	X	-
23MCA01.CO2	X	X	X	-	-	-	-	-	-	-	-	X	-	X	-
23MCA01.CO4	X	X	X	-	-	-	-	-	-	-	-	X	-	X	-
23MCA01.CO5	X	X	-	-	-	-	-	-	-	-	-	X	-	X	-

Unit-I LOGIC AND PROOFS **9**

Propositional Logic – Propositional equivalences - Rules of inference-introduction to Proofs-Proof Methods and strategy-Predicates and quantifiers.

Unit-II COMBINATORICS **9**

Mathematical inductions - Strong induction and well ordering. The basics of counting-The pigeonhole principle – Permutations and combinations-Recurrence relations-Solving Linear recurrence relations-generating functions-inclusion and exclusion and applications.

Unit-III GRAPHS **9**

Graphs and graph models-Graph terminology and special types of graphs-Representing graphs and graph isomorphism - connectivity-Euler and Hamilton paths.

Unit-IV ALGEBRAICSTRUCTURES **9**

Algebraic systems-Semi groups and monoids-Groups-Subgroups and homomorphisms- Cosets and Lagrange's Theorem - Ring & Fields (Definitions and examples).

Unit-V LATTICESANDBOOLEANALGEBRA **9**

Partial ordering-Posets-Lattices as Posets- Properties of lattices-Lattices as Algebraic systems –Sub lattices – direct product and Homomorphism-Some Special lattices- Boolean Algebra

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kenneth H.Rosen	Discrete Mathematics and its Applications	Tata Mc Graw Hill Pub. Co.Ltd., Seventh Edition, Special Indian Edition, New Delhi	2011
2.	Tremblay J.P.and Manohar R	Discrete Mathematical Structures with Applications to Computer Science	Tata McGraw Hill Pub. Co. Ltd,30thReprint, NewDelhi	2011
3.	William Stallings	Computer Organization&Architecture–Designing for Performance	Pearson Education	2012

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ralph.P.Grimaldi	Discrete and Combinatorial Mathematics: An Applied Introduction	Pearson Education, 3rdEdition,New Delhi	2014
2.	Seymour Lipschutz and Mark Lipson	Discrete Mathematics	Schaum's Outlines, Tata McGrawHill Pub. Co. Ltd., Third Edition, New Delhi	2013

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23MCB01	DIGITAL PRINCIPLES	L	T	P	C
		3	0	0	3

Course Objective:

- To impart the knowledge in the field of digital electronics
- To impart knowledge about the various components of a computer and its internals.
- To design and realize the functionality of the computer hardware with basic gates and other components using combinational and sequential logic.
- To understand the importance of the hardware-software interface.

Course Outcomes:

23MCB01.CO1	Able to design digital circuits by simplifying the Boolean functions
23MCB01.CO2	Able to Understand the organization and working principle of computer hardware
23MCB01.CO3	Able to understand mapping between virtual and physical memory
23MCB01.CO4	Acquire knowledge about multiprocessor organization and parallel processing
23MCB01.CO5	Able to trace the execution sequence of an instruction through the processor

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB01.CO1	x	x	x	-	x	-	-	-	-	-	-	x	x	-	-
23MCB01.CO2	x	x	x	x	-	-	-	-	-	x	x	x	x	x	-
23MCB01.CO2	x	x	x	-	x	x	-	-	x	x	-	-	x	-	-
23MCB01.CO4	x	x	x	x	-	-	-	-	x	-	-	x	x	x	-
23MCB01.CO5	x	x	x	-	-	x	-	-	x	-	x	x	x	x	-

Unit-I DIGITAL FUNDAMENTALS 9

Number systems and Conversions –Boolean Algebra and Simplification –Minimization of Boolean Functions– Karnaugh Map-Quine-Mc Cluskey Method-Logic Gates.

Unit-II COMBINATIONAL AND SEQUENTIALCIRCUITS 9

Design of Combinational Circuits – Adder - Subtractor – Encoder – Decoder – MUX - DEMUX – Comparators, Flip Flops – Triggering of Flip Flops – Design of Synchronous Sequential Circuits –Shift Registers.

Unit-III BASIC STRUCTURE OF COMPUTERS 9

Functional UNITs – Basic operational concepts – Bus structures – Instruction and Instruction sequencing – Addressing modes – Instruction Sets –ALU Design.

Unit-IV PROCESSOR DESIGN 9

Processor basics – CPU Organization – Data path control- Hardwired control – Micro programmed control – Pipeline control – Hazards.

Unit-V MEMORY, I/O SYSTEM AND PARALLEL PROCESSING 9

Memory systems and Memory technology – Virtual memory – Cache Memory – Associative memories – Input/output system – Modes of Transfer – DMA - Interrupts – I/O Devices and Interfaces – Symmetric multiprocessors – Cache Coherence.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Morris Mano	Digital Design	Prentice Hall of India	2010
2.	Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian	Computer organization and Embedded Systems	Tata McGrawHill	2012
3.	William Stallings	Computer Organization& Architecture– Designing for Performance	Pearson Education	2012

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	DavidA.Patterson and JohnL.Hennessy	Computer Organization and Design: The Hardware/Software Interface	Morgan Kaufmann Elsevier	2009
2.	Charles H.Roth,Jr.	Fundamentals of Logic Design	Jaico Publishing House, Mumbai	2002

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23MCB02	DATA STRUCTURESUSING C	L	T	P	C
		3	1	0	4

Course Objective:

- To understand the linear and non linear data structures available in solving problems.
- To know about the sorting and searching techniques and its Efficiencies
- To get a clear idea about the various algorithm design techniques.
- To use the data structures and algorithms in real time applications.
- To Able to analyze the efficiency of algorithm.

Course Outcomes:

23MCB02.CO1 Able to select and apply the data structure to suit any given problem.

23MCB02.CO2 Able to design their own data structure according to the application need.

23MCB02.CO3 Able to apply the algorithm design techniques to any of the real world problem.

23MCB02.CO4 Able to develop any new application with the help of data structures and algorithms.

23MCB02.CO5 Able to write efficient algorithm for a given problem and able to analyze its time complexity.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB02.CO1	x	x	x	-	x	-	-	-	-	-	-	x	x	-	-
23MCB02.CO2	x	x	x	x	-	-	-	-	-	x	x	x	x	x	-
23MCB02.CO2	x	x	x	-	x	x	-	-	x	x	-	-	x	-	-
23MCB02.CO4	x	x	x	x	-	-	-	-	x	-	-	x	x	x	-
23MCB02.CO5	x	x	x	-	-	x	-	-	x	-	x	x	x	x	-

Unit-I LINEARDATASTRUCTURES **9**

Introduction-AbstractDataTypes(ADT)–Arraysanditsrepresentation–Structures–Stack –Queue– Circular Queue - Applications of stack – Applications of Queue- Linked Lists – DoublyLinked lists – Applicationsof linkedlist

Unit-II TREESTRUCTURES **9**

Need for non-linear structures – Trees and its representation – Binary Tree – expression trees – Binary tree traversals – applications of trees – Huffman Algorithm - Binary search tree.

Unit-III GRAPHS **9**

Definitions–Representation of graph-Graph Traversals-Depth-firsttraversal–Breadth-first traversal - Applications of graphs - Shortest-path algorithms – Minimum spanning tree – Prim's and Kruskal's algorithms.

Unit-IV INTRODUCTIONTOALGORITHMS **9**

Introduction – Notion of Algorithm – Fundamentals of Algorithmic problem solving – Important problem types –– Brute Force – Selection Sort – Bubble Sort.

Unit-V ALGORITHMDESIGNANDANALYSIS **9**

Algorithm Analysis –Divide and Conquer –Merge Sort –Binary Search - Greedy Algorithms– Knapsack Problem– Dynamic Programming– Warshall's Algorithm for Finding Transitive Closure – Backtracking– Branch and Bound – Travelling Salesman Problem.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of publiction
1.	M.A.Weiss	Data Structures and Algorithm Analysis in C++	Pearson Education Asia	2013
2.	Tanaenbaum A.S.,Langram Y.AugesteinM.J	DataStructuresusingC	Pearson Education	2008
3.	E.Horowitz,S.Sahniand Dinesh Mehta	Fundamentals of Datastructures in C++	University Press	2007

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Thareja	Data Structuresusing C	Oxford Press	2012
2.	AnanyLevitin	Introduction to the Design and Analysis of Algorithms	Pearson Education	2003
3.	V.Aho,J.E.Hopcroft, and J. D. Ullman	DataStructuresandAlgorithms	Pearson Education	2005

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23MCB06	DATA STRUCTURES AND ALGORITHMS LABORATORY	L	T	P	C
		0	0	4	2

Course Objective:

- To understand the linear and non linear data structures available in solving problems.
- To know about the sorting and searching techniques and its Efficiencies.
- To get a clear idea about the various algorithm design techniques.
- To use the data structures and algorithms in real time applications
- To able to analyze the efficiency of algorithm.

Course Outcomes:

23MCB06.CO1 Able to select and apply the data structure to suit any given problem.

23MCB06.CO2 Able to design their own data structure according to the application need.

23MCB06.CO3 Able to apply the algorithm design techniques to any of the real word problem.

23MCB06.CO4 Able to develop any new applications with the help of data structures and algorithms

23MCB06.CO5 Able to write efficient algorithm for a given problem and able to analyze its time complexity.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB06.CO1	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCB06.CO2	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCB06.CO2	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCB06.CO4	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCB06.CO5	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-

Sl.No.	List of Experiments
1.	Polynomial Addition using array.
2.	Array implementation of stack.
3.	Array implementation of Queue.
4.	Infix to post fix conversion.
5.	Singly Linked List operations.
6.	Binary tree traversals.
7.	Quick sort.
8.	Dictionary application using any of the data structure.
9.	Find the Shortest Path using Dijkstra's Algorithm–Greedy method.
10.	Warshall's Algorithm for finding transitive closure using Dynamic programming.
11.	Sum of subset problem using backtracking.

Total Periods: 45

23MCB03	RELATIONAL DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

Course Objective:

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To know about data storage techniques and query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

Course Outcomes:

23MCB03.CO1	Understand the basic concepts of the database and data models.
23MCB03.CO2	Design a database using ER diagrams and map ER into Relations and normalize the relations.
23MCB03.CO3	Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
23MCB03.CO4	Develop a simple database applications using normalization.
23MCB03.CO5	Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB03.CO1	x	x	x	-	-	x	-	-	x	x	-	X	x	-	-
23MCB03.CO2	x	x	x	-	-	x	-	-	x	x	-	X	x	-	-
23MCB03.CO2	x	x	x	-	-	x	-	-	x	x	-	X	x	-	-
23MCB03.CO4	x	x	x	-	-	x	-	-	-	x	-	X	x	-	-
23MCB03.CO5	x	x	x	-	x	x	-	-	x	x	-	X	x	-	-

Unit-I INTRODUCTION **9**

File systems versus Database systems–Data Models–DBMS Architecture–Data Independence–Data Model in gusing Entity–Relationship Model – Enhanced E-RModeling.

Unit-II RELATIONAL MODEL AND QUERY EVALUATION **9**

Relational Model Concepts–Relational Algebra–SQL–Basic Queries–Complex SQL Queries–Views–Constraints– Relational Calculus–Dynamic and embedded SQL-Database Design – Functional Dependencies– Normalization.

Unit-III TRANSACTION PROCESSING **9**

Transaction Processing–Properties of Transactions -Serializability–Transaction support in SQL - Locking Techniques–Time Stamp ordering–Validation Techniques– Granularity of Data Items– Recovery concepts– Shadow paging – Concurrency control-Log Based Recovery–Deadlock Handling, Insert and Delete Operations.

Unit-IV FILES AND INDEXING **9**

File operations–Hashing Techniques–Indexing–Single level and Multi-level Indexes–B+tree–Static Hashing- Indexes on Multiple Keys.

Unit-V SPECIAL PURPOSE DATABASES **9**

OODBMS--Object-Based Databases-OO Data Model-OO Languages–Persistence–Object Relational Databases- XML–Temporal Databases– Mobile Databases – Spatial Databases.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Abraham Silberschatz, Henry F.Korth and S.Sundarshan	DatabaseSystem Concepts	Mc Graw Hill	2010
2.	C.J.Date	An Introduction to Database Systems	Pearson Education	2008
3.	PeterRob, Carlos Coronel	DatabaseSystem Concepts	Cengage Learning	2008

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ramez Elamassri and ShankantB-Navathe,	Fundamentals of Database Systems	Pearson Education Limited	2010
2.	Raghu Ramakrishnan, Johannes Gehrke	Database Management Systems	Mc Graw Hill	2003
3.	Frank.P. Coyle	XML, Web Services And The Data Revolution	Pearson Education Limited	2012

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23MCB07	RELATIONAL DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		0	0	4	2

Course Objective:

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To know about data storage techniques and query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

Course Outcomes:

23MCB07.CO1 Understand the basic concepts of the database and data models.

23MCB07.CO2 Design a database using ER diagrams and map ER into Relations and normalize the relations.

23MCB07.CO3 Acquire the knowledge of query evaluation to monitor the performance of the DBMS.

23MCB07.CO4 Develop a simple database applications using normalization.

23MCB07.CO5 Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB07.CO1	x	x	x	-	-	x	-	-	x	x	-	X	x	-	-
23MCB07.CO2	x	x	x	-	-	x	-	-	x	x	-	X	x	-	-
23MCB07.CO2	x	x	x	-	-	x	-	-	x	x	-	X	x	-	-
23MCB07.CO4	x	x	x	-	-	x	-	-	-	x	-	X	x	-	-
23MCB07.CO5	x	x	x	-	x	x	-	-	x	x	-	X	x	-	-

Sl.No.	List of Experiments
1.	Creation of base tables and Views.
2.	Data Manipulation INSERT, DELETE and UPDATE in Tables. SELECT, Sub Queries and JOIN.
3.	Data Control Commands.
4.	High level language extensions–PL/SQL. Or Transact SQL–Packages.
5.	Use of Cursors, Procedures and Functions.
6.	Embedded SQL or Database Connectivity.
7.	Oracle or SQL Server Triggers–Block Level–Form Level Triggers.
8.	Working with Forms, Menus and Report Writers for a application project in any domain.

Total Periods: 45

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23MCB04	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		3	1	0	4

Course Objective:

- To know the basics of algorithmic problem solving
- To develop Python programs with conditionals and loops
- To define Python functions and use function calls
- To use Python data structures-lists, tuples, dictionaries
- To do input/output with files in Python

Course Outcomes:

23MCB04.CO1	Develop algorithmic solutions to simple computational problems
23MCB04.CO2	Develop and execute simple Python programs
23MCB04.CO3	Decompose a Python program into functions
23MCB04.CO4	Represent compound data using Python lists, tuples, dictionaries etc.
23MCB04.CO5	Read and write data from/to files in Python programs

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB04.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCB04.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB04.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB04.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB04.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

Unit-I INTRODUCTION TO COMPUTING AND PROBLEM SOLVING 9

Fundamentals of Computing – Computing Devices – Identification of Computational Problems – Pseudo codes and Flowcharts – Instructions – Algorithms – Building Blocks of Algorithms – Introduction to Python Programming – Python Interpreter and Interactive Mode – Variables and Identifiers – Arithmetic Operators– Values and Types – Statements.

Unit-II CONDITIONALS AND FUNCTIONS 9

Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If-Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement – Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Functions.

Unit-III SIMPLE DATA STRUCTURES IN PYTHON 9

Introduction to Data Structures – List – Adding Items to a List – Finding and Updating an Item – Nested Lists – Cloning Lists – Looping Through a List – Sorting a List – List Concatenation – List Slices – List Methods – List Loop – Mutability – Aliasing – Tuples: Creation, Accessing, Updating, Deleting Elements in a Tuple, Tuple Assignment, Tuple as Return Value, Nested Tuples, Basic Tuple Operations– Sets.

Unit-IV STRINGS, DICTIONARIES, MODULES 9

Strings: Introduction, Indexing, Traversing, Concatenating, Appending, Multiplying, Formatting, Slicin Comparing,Iterating–Basic-built-In String Functions–Dictionary:Creating,Accessing,Adding Items,Modifying,Deletin Sorting, Looping, Nested Dictionaries Built-in Dictionary Function – Finding Key and Value in a Dictionary Modules – Module Loading and Execution – Packages – Python Standard Libraries.

Unit-V FILE HANDLING AND EXCEPTION HANDLING 9

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

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Reema Thareja	Python Programming:Using Problem Solving Approach	Oxford University Press	2017
2.	Allen B.Downey	Think Python: How to Think Like a Computer Scientist	Shroff/O'Reilly Publishers	2016

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Guido van Rossum, Fred L. Drake Jr	An Introduction to Python– Revised and Updated for Python 3.2	Network Theory Ltd.,	2011
2.	John VGuttag	Introduction to Computation and Programming Using Python	MIT Press	2013
3.	Charles Dierbach	Introduction to Computer Science using Python	Wiley India Edition	2016
4.	Timothy A.Budd	Exploring Python	Mc-GrawHill Education (India) Private Ltd	2015
5.	Kenneth A.Lambert	Fundamentals of Python:First Programs	Cengage Learning	2012

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23MCB08	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

Course Objective:

- To know the basics of algorithmic problem solving
- To develop Python programs with conditionals and loops
- To define Python functions and use function calls
- To use Python data structures-lists, tuples, dictionaries
- To do input/output with files in python

Course Outcomes:

23MCB08.CO1	Develop algorithmic solutions to simple computational problems
23MCB08.CO2	Develop and execute simple python programs
23MCB08.CO3	Decompose a Python program into functions
23MCB08.CO4	Represent compound data using Python lists, tuples, dictionaries etc.
23MCB08.CO5	Read and write data from/to files in Python programs

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB08.CO1	x	x	x	x	x	x	-	-	x	x	-	x	x	x	-
23MCB08.CO2	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
23MCB08.CO3	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
23MCB08.CO4	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
23MCB08.CO5	x	x	x	x	x	x	-	-	x	x	-	x	x	x	-

Sl.No.	List of Experiments
1.	Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
2.	Python programming using simple statements and expressions.
3.	Scientific problems using Conditionals and Iterative loops.
4.	Implementing real-time/technical applications using Lists, Tuples
5.	Implementing real-time/technical applications using Sets, Dictionaries.
6.	Implementing programs using Functions.
7.	Implementing programs using Strings.
8.	Implementing programs using written modules and Python Standard Libraries.
9.	Implementing real-time/technical applications using File handling.
10.	Implementing real-time/technical applications using Exception handling.
11.	Exploring Pygame tool.
12.	Developing a game activity using Pygame like bouncing ball, carrace etc.

Total Periods: 45

23MCB05	OPERATING SYSTEMS	L	T	P	C
		3	1	0	4

Course Objective:

- To make the students understand the basic operating system concepts as processes.
- Threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystem and protection.
- To get acquaintance with the class of abstractions afford the general.
- To impart knowledge in purposes operating systems that aid the development of user applications.

Course Outcomes:

23MCB05.CO1 Able to understand the operating system components and its services.

23MCB05.CO2 Implement the algorithms in process management and solving the issues of IPC.

23MCB05.CO3 Able to demonstrate the mapping between the physical memory and virtual memory

23MCB05.CO4 Able to understand file handling concepts in OS perspective.

23MCB05.CO5 Able to understand the operating system components and services with the recent OS.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB05.CO1	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB05.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB05.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB05.CO4	x	x	x	-	-	x	-	-	-	x	-	x	x	-	-
23MCB05.CO5	x	x	x	-	x	x	-	-	x	x	-	x	x	-	-

Unit-I OPERATING SYSTEMS OVERVIEW 9

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

Unit-II THREADS AND SCHEDULING ALGORITHMS 9

Multi core Programming-Multi-threading Models-Thread Libraries-Threading Issues-Process Synchronization: The Critical Section problem-Peterson's Solution- Synchronization Hardware-Mutex Locks-Semaphores-Classic problems of Synchronization- Monitors-Synchronization examples-Alternative approaches-CPU Scheduling: Synchronization-Criteria- Scheduling Algorithms-Thread Scheduling-Multiple Processor Scheduling- Real-Time CPU Scheduling Algorithm Evaluation

Unit-III MEMORY MANAGEMENT 9

Swapping- Contiguous memory allocation-segmentation-paging-Structure of the page table-Virtual Memory: Demand Paging- page-replacement-Allocation of frames-Thrashing- Memory Mapped Files-Allocating Kernel Memory Deadlocks: System Model- Deadlock Characterization-Methods of Handling Deadlock-Deadlock prevention-Detection and Avoidance- Recovery from deadlock.

Unit-IV STORAGE AND FILE MANAGEMENT 9

Mass-Storage structure-Disk structure- Disk attachment- Disk Scheduling-Swap-Space management- RAID structure- Stable-storage implementation-File system interface: The concept of a file-Access Methods- Directory and disk structure- File system mounting- File sharing-Protection-File system implementation: File-System structure-File-system implementation-Directory implementation-Allocation Methods-Free-Space management.

Unit-V CASE STUDY – LINUX SYSTEM 9

DOS-Linux System-Basic Concept: Administration-Requirements for Linux System Administrator-Setting up a LINUX Multi function Server-Domain Name System-Setting up Local Network Services: Virtualization-Basic Concepts-Setting upXen, VMware on Linux Host and Adding Guest OS.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Abraham Silberschatz, Henry F.Korth and S.Sundarshan	Database System Concepts	McGrawHil	2010
2.	C.J. Date	An Introduction to Database Systems	Pearson Education	2008
3.	PeterRob, Carlos Coronel	Database System Concepts	Cengage Learning	2008

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Operating Systems: Internals and Design Principles	Seventh Edition, Prentice Hall	2011
2.	H M Deital, P J Deital and D R Choffnes,	Operating Systems	Third edition, Pearson Education	2011
3.	D M Dhamdhere	Operating Systems: A Concept- based Approach", Second Edition,	Tata McGraw-Hill Education, 2007.	2007

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23MCB21	INFORMATION TECHNOLOGY	L	T	P	C
		3	0	0	3

Course Objective:

- To provide knowledge on Information concepts and processing
- To Learn the concepts of programming languages
- To provide knowledge on Operating system
- To provide networking knowledge
- To learn the computer security and applications

Course Outcomes:

23MCB21.CO1	The students will be able to gain knowledge on Information processing concepts
23MCB21.CO2	The students will be able to learn the concepts of programming languages
23MCB21.CO3	The students will be able to gain knowledge on Operating System
23MCB21.CO4	The students will be able to gain networking knowledge
23MCB21.CO5	The students will be able to learn the computer security and applications

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB21.CO1	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB21.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB21.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB21.CO4	x	x	x	-	-	x	-	-	-	x	-	x	x	-	-
23MCB21.CO5	x	x	x	-	x	x	-	-	x	x	-	x	x	-	-

Unit-I INTRODUCTION 9

Information concepts and processing: Evolution of information processing- data information language and communication-Elements of a computer processing system: Hardware – CPU- storage devices and media-VDU-input-output devices-data communication equipment - Software- system software- application software

Unit-II PROGRAMMING LANGUAGES 9

Classification- machine code-assembly language-higher level languages-fourth generation languages.

Unit-III OPERATING SYSTEMS 9

Concept as resource manager and coordinator of processor-devices and memory-Concept of priorities-protection and parallelism-Command interpreter-Typical commands of DOS/ UNIX/Network-Gui- Windows.

Unit-IV COMPUTERS AND COMMUNICATION 9

Single user- multi-user-work station-client server systems- Computer networks-network protocols-LAN-WAN- Internet facilities through WWW-Mosaic-Gopher- html-elements of Java.

Unit-V COMPUTER SECURITY AND APPLICATIONS 9

Information integrity -definition -ensuring integrity- Computer security - Perverse software concepts and components of security- Preventive measures and treatment-Range of application – Scientific-business-educational-industrial-national level weather forecasting- remote sensing-planning- multilingual applications.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Shambhaviroy	Fundamental of Information Technology	Prentice Hall of India(2nd edition), New Delhi	2008
2.	Sanders, D.H.	Computers Today	McGraw Hill	1988

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rajaraman V	Fundamental of Computers	Prentice Hall of India(2nd edition), New Delhi	1996
2.	Sanders, D.H.	Computers Today	McGraw Hill	1988

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23MCB22	DATA PROCESSING LABORATORY	L	T	P	C
		0	0	4	2

Course Objective:

- To give basic information about the computer system.
- To give knowledge about computer hardware and computer software.
- To familiarize students with the use of MS Windows, Internet and E-mail.
- To familiarize students with the use of MS Office-MS Word, MS Excel & MS PowerPoint.

Course Outcomes:

23MCB22.CO1	Understand the Basic Concepts of the Performing Basic Editing Functions, Formatting Text,Copy and Moving Objects and Text.
23MCB22.CO2	Understanding the process of Inserting Table Of Contents.
23MCB22.CO3	Creating and producing a Mail Merge
23MCB22.CO4	Learning formulas, creating charts and graphs that can easily explain or simplify complex information or data.
23MCB22.CO5	Learning to Modify Presentation Themes

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB22.CO1	x	x	x	-	-	-	-	-	-	-	-	x	x	-	-
23MCB22.CO2	x	x	x	-	-	-	x	-	x	x	-	x	x	-	-
23MCB22.CO3	x	x	x	-	x	-	x	-	x	x	-	x	x	-	-
23MCB22.CO4	x	x	x	-	x	-	x	-	x	x	-	x	x	-	-
23MCB22.CO5	x	x	x	-	x	-	x	-	x	x	-	x	x	-	-

Sl.No.	List of Experiments
1.	Document Creation – Bold, Italic, Underline and Text , Background Colors .
2.	Document Creation - Text Justification, Bullets and Numbering and Spell Checking.
3.	Text Manipulation With Scientific Notations.
4.	Table Creation and Table Manipulation.
5.	Mail Merge and Letter Preparation.
6.	Generating Bar Chart using data in Excel.
7.	Generating XY Chart using data in Excel.
8.	Calculations using formula in Excel.
9.	Creation of presentation using animation effects.

Total Periods: 45

23MCB23	PUBLIC SPEAKING AND SKILL DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2

Course Objective:

- Establish rapport with your audience.
- Learn Public Speaking techniques to reduce nervousness and fear.
- Understand your Public Speaking strengths as a presenter and how to appeal to different types of people.
- Learn visual aids to enhance speaker presentations.

Course Outcomes:

23MCB23.CO1 Explain the goals and benefits of public speaking.
23MCB23.CO2 Improve essential presentation skills: reading the audience and speaker control.
23MCB23.CO3 Identify key principles of ethical communication.
23MCB23.CO4 Describe key considerations in speaking to diverse and multicultural audiences
23MCB23.CO5 Identify strategies for effect interviewing.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB23.CO1	x	x	x	-	-	-	-	-	-	-	-	x	x	-	-
23MCB23.CO2	x	x	x	-	-	-	x	-	x	x	-	x	x	-	-
23MCB23.CO3	x	x	x	-	x	-	x	-	x	x	-	x	x	-	-
23MCB23.CO4	x	x	x	-	x	-	x	-	x	x	-	x	x	-	-
23MCB23.CO5	x	x	x	-	x	-	x	-	x	x	-	x	x	-	-

Sl.No.	List of Experiments
1.	Self Introduction to Public.
2.	Special Occasion Speech.
3.	How to Promote Your Product to Public
4.	Interview
5.	Role Play
6.	Motivational Speech
7.	Demo Class
8.	Group Discussion
9.	Oral Presentation
10.	Social Awareness Speech

Total Periods: 45

23MCB09	DATA COMMUNICATION AND NETWORKS	L	T	P	C
		3	0	0	3

Course Objective:

- To understand networking concepts and basic communication model
- To understand network architectures and components required for data communication.
- To analyze the function and design strategy of physical, data link, network layer and transport layer
- To Acquire knowledge of various application protocol standard developed for internet

Course Outcomes:

23MCB09.CO1	Able to Identify the components required to build different types of networks
23MCB09.CO2	Able to understand the functionalities needed for data communication into layers
23MCB09.CO3	Able to choose the required functionality at each layer for given application
23MCB09.CO4	Able to understand the working principles of various application protocols
23MCB09.CO5	Acquire knowledge about security issues and services available

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB09.CO1	x	x	x	-	-	-	-	-	-	-	-	x	x	-	-
23MCB09.CO2	x	x	x	-	-	-	x	-	x	x	-	x	x	-	-
23MCB09.CO2	x	x	x	-	x	-	x	-	x	x	-	x	x	-	-
23MCB09.CO4	x	x	x	-	x	-	x	-	x	x	-	x	x	-	-
23MCB09.CO5	x	x	x	-	x	-	x	-	x	x	-	x	x	-	-

Unit-I NETWORK FUNDAMENTALS 9

Introduction to Networks–Categories of Networks-Communication model–Data transmission concepts and terminology– Protocol architecture–Protocols–OSI–TCP/IP– LAN Topology –Transmission media.

Unit-II DATA LINK LAYER 9

Data link control– Error Detection – VRC – LRC – CRC – Checksum – Error Correction– Hamming Codes – MAC–Ethernet, Token ring , Token Bus – Wireless LAN - Bluetooth – Bridges.

Unit-III NETWORK LAYER 9

Network layer–Switching concepts–Circuit switching–Packet switching– IP Addressing –IPV4, IPV6 –Routing Protocols–Distance Vector–Link State.

Unit-IV TRANSPORT LAYER 9

Transport layer– service– Connection establishment–Flow control–Transmission control protocol– Congestion control and avoidance –User datagram protocol – Transport for Real Time Applications (RTP).

Unit-V APPLICATIONS 9

Applications -DNS –E-Mail Protocols–WWW– SNMP – SMTP - Security– Threats and Services- Cryptography - DES-RSA- Web Security-SSL.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Forouzan	Data Communication and Networking	TMH	2012
2.	LarryL.Peterson& Bruce S. Davie	Computer Networks–A systems Approach	HarcourtAsia/Morgan Kaufmann	2010
3.	William Stallings	Data and Computer Communications	Prentice Hall	2011

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Andrew S.Tannen baum David J.Wetherall	Computer Networks	Pearson Education	2011
2.	JamesF.Kurose, KeithW.Ross	Computer Networking: A Top- down Approach	Pearson Education	2012
3.	JohnCowley	Communications and Networking: An Introduction	Springer Indian Reprint	2010

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23MCB10	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

Course Objective:

- To provide an insight into the processes of software development
- To understand and practice the various fields such as analysis, design, development, testing of Software Engineering.
- To develop skills to construct software of high quality with high reliability
- To apply metrics and testing techniques to evaluate the software
- To provide an insight into the processes of software development

Course Outcomes:

23MCB10.CO1	Get an insight into the processes of software development
23MCB10.CO2	Able to understand the problem domain for developing SRS and various models of software engineering
23MCB10.CO3	Able to Model software projects into high level design using DFD,UML diagrams
23MCB10.CO4	Able to Measure the product and process performance using various metrics
23MCB10.CO5	Able to Evaluate the system with various testing techniques and strategies

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB10.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCB10.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB10.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB10.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB10.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

Unit-I INTRODUCTION **9**

Software Engineering paradigms – Waterfall Life cycle model – Spiral Model–Prototype Model–Fourth Generation Techniques – Planning – Software Project Scheduling, – Risk analysis and management – Requirements and Specification

Unit-II SOFTWARE DESIGN **9**

Abstraction – Modularity – Software Architecture – Cohesion – Coupling – Various Design Concepts and notations – Real time and Distributed System Design – Documentation – Data flow Oriented design – Jackson System development – Designing for reuse – Programming standards – Case Study for Design of any Application Project.

Unit-III SOFTWARE TESTING AND MAINTENANCE **9**

Software Testing Fundamentals – Software testing strategies – Black Box Testing – White Box Testing – System Testing – Object Orientation Testing – State based Testing - Testing Tools – Test Case Management – Software Maintenance Organization – Maintenance Report – Types of Maintenance.

Unit-IV SOFTWARE METRICS **9**

Scope – Classification of metrics – Measuring Process and Product attributes –Direct and Indirect measures–Cost Estimation - Reliability– Software Quality Assurance – Standards –COCOMO model.

Unit-V SCM **9**

Need for SCM–Version Control –SCM process–Software Configuration Items–Taxonomy–CASE Repository–Features – Web Engineering

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Roger S.Pressman	Software Engineering:A Practitioner Approach	McGrawHill	2010
2.	Richard Fairley	Software Engineering Concepts	Tata McGraw Hill Edition	2008
3.	AliBehforroz, Frederick J.Hudson	Software Engineering Fundamentals	Oxford Indian Reprint	2012

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jibitesh Mishra, Ashok Mohanty	Software Engineering	Pearson Educatio	2012
2.	Kassem A.Saleh	Software Engineering	J.RossPublishing	2009

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23MCB11	INTERNET AND JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

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 enhance the knowledge to server side program
- To provide knowledge on advanced features like Swing, Java Bingeans, Sockets.

Course Outcomes:

23MCB11.CO1	Able to understand the internet standards and recent web technologies like Conferencing, newsgroup
23MCB11.CO2	Able to implement, compile, test and run Java program
23MCB11.CO3	Able to make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API.
23MCB11.CO4	Able to understand the components and patterns that constitute a suitable architecture for a web application using java servlets.
23MCB11.CO5	Able to demonstrate systematic knowledge of back end and front end by developing an appropriate application.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB11.CO1	x	x	x	-	x	-	-	-	x	-	-	x	x	-	-
23MCB11.CO2	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-
23MCB11.CO2	x	x	x	x	x	--	-	-	x	-	-	x	x	-	-
23MCB11.CO4	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-
23MCB11.CO5	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-

Unit-I INTERNET APPLICATIONS **9**

Domain Name System - Exchanging E-mail – Sending and Receiving Files - Fighting Spam, Sorting Mail and avoiding e-mail viruses – Chatting and Conferencing on the Internet – Online Chatting - Messaging – Usenet Newsgroup – Voice and Video Conferencing – Web Security.

Unit-II JAVA FUNDAMENTALS **9**

Java features–Java Platform– Java Fundamentals–Expressions, Operators, and Control Structures –Classes, Packages and Interfaces – Exception Handling.

Unit-III PACKAGES **9**

AWT package–Layouts–Containers–Event Package–Event Model–Garbage Collection– Multithreading.

Unit-IV ADVANCED JAVA PROGRAMMING **9**

Utility Packages –Input Output Packages–Inner Classes–Java Database Connectivity-Servlets-RMI –Swing Fundamentals

Unit-V JAVA BEANS AND NETWORKING **9**

Java Beans – Application Builder Tools - Using the Bean Developer Kit-Jar Files-Introspection- BDK- Using Bean Info Interface–Persistence-Java Beans API –Using Bean Builder –Networking Basics -Java and the Net– I net Address –TCP/IP Client Sockets – TCP/IP Server Sockets.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Margaret Levine Young	Internet and WWW	Tata McGrawHiil	2012
2.	Paul J.Deitel, Harvey M.Deitel	Internet & WorldWideWeb: How to Program	Pearson Education International	2011
3.	Herbert Schildt	The Complete Reference– Java 2	Tata McGrawHill	2010

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
3.	Joyce Farrell	Java Programming	Cengage Learning	2011
4.	C.Xavier	Java Programming:A Practical Approach	Tata McGrawHill	2011
5.	Keyurshah	Gateway to Java Programmer Sun Certification	Tata McGrawHill	2002
6.	Poornachandra Sarang	Java Programming	Tata McGrawHill Professional	2012
7.	HerbertSchildt, DaleSkrien	Java Fundamentals–A Comprehensive Introduction	Tata McGrawHill	2013

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23MCB14	INTERNET AND JAVA PROGRAMMING LABORATORY	L	T	P	C
		3	0	0	3

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 enhance the knowledge to server side program
- To provide knowledge on advanced features like Swing, Java Bingeans, Sockets.

Course Outcomes:

23MCB14.CO1	Able to understand the internet standards and recent web technologies like Conferencing, newsgroup
23MCB14.CO2	Able to implement, compile, test and run Java program
23MCB14.CO3	Able to make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API.
23MCB14.CO4	Able to understand the components and patterns that constitute a suitable architecture for a web application using java servlets.
23MCB14.CO5	Able to demonstrate systematic knowledge of back end and front end by developing an appropriate application.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB14.CO1	x	x	x	-	x	-	-	-	x	-	-	x	x	-	-
23MCB14.CO2	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-
23MCB14.CO2	x	x	x	x	x	--	-	-	x	-	-	x	x	-	-
23MCB14.CO4	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-
23MCB14.CO5	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-

Sl.No.	List of Experiments
1.	Basics-Sending and receiving mails from one or more email clients, Video Conferencing demonstration.
2.	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
3.	Writing window based GUI applications using frames and applets such as Calculator application, Fahrenheit to Centigrade conversion etc.
4.	Application of threads examples.
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.
9. Create a Personal Information System using Swing.
10. Event Handling in Swing.

Total Periods: 45

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23MCB12	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
		3	0	0	3

Course Objective:

- To provide a brief, hands-on overview of object-oriented concepts and its life cycle for software development.
- To learn for modeling the software and to design them using UML diagrams
- To understand the problem domain and to identify the objects from the problem specification.
- To understand, how to apply design axioms and corollaries for the classes and object relational systems.
- To provide a brief, hands-on overview of object-oriented concepts and its life cycle for software development.

Course Outcomes:

23MCB12.CO1	Able to understand the object oriented concepts and to apply object oriented life cycle model for a project.
23MCB12.CO2	Able to design static and dynamic models using UML diagrams.
23MCB12.CO3	Able to perform object oriented analysis to identify the objects from the problem specification.
23MCB12.CO4	Able to identify and refine the attributes and methods for designing the object oriented system.
23MCB12.CO5	Able learn the open source CASE tools and to apply them in various domains.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB12.CO1	x	x	x	-	x	-	-	-	x	-	-	x	x	-	-
23MCB12.CO2	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-
23MCB12.CO2	x	x	x	x	x	--	-	-	x	-	-	x	x	-	-
23MCB12.CO4	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-
23MCB12.CO5	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-

Unit-I INTRODUCTION **9**

An overview–Object basics– Object state and properties–Behavior–Methods–Messages–Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding –Persistence – Meta classes – Object oriented system development life cycle.

Unit-II METHODOLOGY AND UML **9**

Introduction –Survey– Rumbaugh, Booch, Jacobson methods –Unified modeling language–Static and Dynamic models – Rational Rose Suite - UML diagrams – Static diagram : Class diagram – Use case diagrams – Behavior Diagram : Interaction diagram – State chart diagram – Activity diagram - Implementation diagram: Component diagram – Deployment diagram – example - Design of online railway reservation system using UML diagrams - Dynamic modeling – Model organization– Extensibility.

Unit-III OBJECT ORIENTED ANALYSIS **9**

Design process and benchmarking – Axioms – Corollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – Databases – Object relational systems – Designinginterfaceobjects – Macroand Microlevel processes – Thepurposeofa viewlayer interface-OOUI - MVC Architectural Pattern and Design – Designingthe system.

Unit-IV OBJECT ORIENTED DESIGN **9**

Design process and bench marking – Axioms – Corollaries – Designing classes – Class visibility – Refining

attributes – Methods and protocols – Object storage and object interoperability – Databases – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface-OOUI - MVC Architectural Pattern and Design – Designing the system.

Unit-V CASE TOOLS **9**

Railway domain:Platform assignment system for the trains in a railway station–Academic domain:Students marks analyzing system – ATM system – Stock maintenance – Quiz System – E-mail Client system – Cryptanalysis – Health Care Systems, Use Open Source CASE Tools: StarUML / UML Graph for the above case studies.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ali Bahrami	Object Oriented System Development	McGraw Hill International Edition	2008
2.	Brahma Dathan, Sarnath Ramnath	Object-Oriented Analysis, Design and Implementation	Universities Press	2010
3.	Bernd Bruegge, Allen H. Dutoit	Object Oriented Software Engineering using UML	Patterns and Java	2004

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Craig Larman	Applying UML and Patterns–An Introduction to Object-Oriented Analysis and Design and Iterative Development	3rdEdition,Pearson Education	2005
2.	Grady Booch, James Rumbaugh, Ivar Jacobson	The UnifiedModelingLanguage User Guide	AddisonWesley Longman	1999
3.	Martin Fowler	UML Distilled A Brief Gu Standard Object Modeling L	3rdEdition, Addison Wesley	2003

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23MCB15	SOFTWARE DEVELOPMENT- CASE TOOLS LABORATORY	L	T	P	C
		0	0	4	2

Course Objective:

- To describe the object-oriented software development process,including object- oriented methodologies and work flow
- To familiarize various UML diagrams like class, object, interaction, collaboration, sequence and activity diagrams.
- To develop an efficient software using case tools.
- To describe the individual Phases/modules of the project and Identify deliver ables.
- To understand the software engineering methodologies for project development.

Course Outcomes:

23MCB15.CO1	Use software's to design an application using Object Oriented approach
23MCB15.CO2	Apply suitable design patterns in system design
23MCB15.CO3	Critique Object Oriented analysis and system design using Object Oriented Principles
23MCB15.CO4	Ability to generate a high-level design of the system from the software requirements
23MCB15.CO5	Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB15.CO1	x	x	x	x	-	-	-	-	x	x	-	x	x	-	-
23MCB15.CO2	x	x	-	x	x	x	-	-	x	x	-	x	x	-	-
23MCB15.CO2	x	x	x	-	x	x	-	-	x	x	-	x	x	-	-
23MCB15.CO4	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
23MCB15.CO5	x	x	x	x	x	x	-	-	x	x	-	x	x	-	-

Sl.No.	List of Experiments
1.	Practicing the different types of case tools such as Rational Rose / other Open Source be used for all the phases of Software development life cycle.
2.	Data modeling.
3.	Source code generators.
4.	Apply the following to typical application problems:

1) Project Planning
2) Software Requirement Analysis
3) Software Design
4) Data Modeling & Implementation
5) Software Estimation

6) Software Testing

A possible set of applications may be the following:

a) Library System
b) Student Marks Analyzing System
c) Text Editor
d) Create a dictionary
e) Telephone directory.
f) Inventory System

Total Periods: 45

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23MCB13	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

Course Objective:

- To explore the fundamental concepts of big data analytics
- To learn to analyze the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.
- To understand the applications using Map Reduce Concepts.

Course Outcomes:

23MCB13.CO1	Work with big data platform and understand the fundamentals of various big data analysis techniques.
23MCB13.CO2	Analyze the big data analytic techniques for useful business applications.
23MCB13.CO3	Design efficient algorithms for mining the data from large volumes.
23MCB13.CO4	Analyze the HADOOP and Map Reduce technologies associated with big data analytics.
23MCB13.CO5	Explore the applications of Big Data

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB13.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCB13.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB13.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB13.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB13.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

Unit-I INTRODUCTION TO BIG DATA 9

Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data-Analytic Processes and Tools –Analysis vs Reporting-Modern Data Analytic Tools -Statistical Concepts Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

Unit-II MINING DATA STREAMS 9

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing – Sampling Data in a Stream–Filtering Streams–Counting Distinct Elements in a Stream –Estimating Moments–Counting Oneness in a Window–Decaying Window- Real time Analytics Platform (RTAP) Applications –-Case Studies-Real Time Sentiment Analysis, Stock Market Predictions.

Unit-III HADOOP ENVIRONMENT 9

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Hadoop file systems-Java interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run- Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features - Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop.

Unit-IV DATA ANALYSIS SYTEMS AND VISUALIZATION 9

Link Analysis – Page Rank - Efficient Computation of Page Rank- Topic-Sensitive Page Rank – Link Spam-Recommendation Systems- A Model for Recommendation Systems- Content Based Recommendations -

Collaborative Filtering- Dimensionality Reduction- Visualizations - Visual data analysis techniques-interaction techniques- Systems and applications.

Unit-V DATA ANALYTICS USING PYTHON 9

Python Pandas - Introduction - Working with Series, Data Frame, and Panel - Basic functionality - Descriptive Statistics - Creating Data Frame - Creating an Empty Data Frame - Creating a Data Frame from Lists - Creating a Data Frame from Dict of and arrays / Lists - Creating a Data Frame from List of Dicts - Creating a Data Frame from Dict of Series - Column Selection - Column Addition - Column Deletion - Row Selection, Addition, and Deletion - Working with CSV file - Displaying the content of data frame - Creating sub data frame, Sorting, Handling missing data, Querying, Grouping, and Compute columns.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Anand Rajaraman and Jeffrey David Ullman	Mining of Massive Datasets	Cambridge University Press	2014
2.	ChrisEaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos	Understanding BigData: Analytics for Enterprise Class Hadoop and Streaming Data	McGrawHill Publishing	2012
3.	DaRuan, Guoquing Chen, Etienne E.Kerre,Geert Wets	Intelligent Data Mining	Springer	2007

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Michael Minelli, Michele Chambers , Ambiga Dhiraj	Big Data, Big Analytics:Emerging Business Intelligence and Analytic Trendsfor Today's Businesses	Wiley Publications	2013
2.	Tom White	Hadoop: The Definitive Guide	O"reillyMedia	2015

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23MCB16	DATA ANALYTICS LABORATORY	L	T	P	C
		0	0	4	2

Course Objective:

- To explore the fundamental concepts of big data analytics
- To learn to analyze the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.
- To understand the applications using Map Reduce Concepts.

Course Outcomes:

23MCB16.CO1	Work with big data platform and understand the fundamentals of various big data analysis techniques.
23MCB16.CO2	Analyze the big data analytic techniques for useful business applications.
23MCB16.CO3	Design efficient algorithms for mining the data from large volumes.
23MCB16.CO4	Analyze the HADOOP and Map Reduce technologies associated with big data analytics.
23MCB16.CO5	Explore the applications of Big Data

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB16.CO1	x	x	x	x	x	x	-	-	x	x	-	x	x	x	-
23MCB16.CO2	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
23MCB16.CO2	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
23MCB16.CO4	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
23MCB16.CO5	x	x	x	x	x	x	-	-	x	x	-	x	x	x	-

Sl.No.	List of Experiments
	Hadoop
1.	Install, configure and run Hadoop and HDFS
2.	Implement word count / frequency programs using Map Reduce
3.	Implement an MR program that processes a weather data set
	R - Programming
4.	Implement Linear and logistic Regression
5.	Implement SVM / Decision tree classification techniques
6.	Implement clustering techniques
7.	Visualize data using any plotting framework
8.	Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R

Total Periods: 45

23MCC01	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
		0	0	4	2

Course Objective:

- To know of 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

Course Outcomes:

23MCC01.CO1	Understand the activities during the project scheduling of any software application.
23MCC01.CO2	Learn the risk management activities and the resource allocation for the projects.
23MCC01.CO3	Can apply the software estimation and recent quality standards for evaluation of the software projects
23MCC01.CO4	Acquire knowledge and skills needed for the construction of highly reliable software project
23MCC01.CO5	Understand the activities during the project scheduling of any software application.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC01.CO1	x	x	x	-	-	-	-	-	-	-	-	x	x	-	-
23MCC01.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC01.CO2	x	x	x	x	x	x	-	-	x	x	x	x	x	-	-
23MCC01.CO4	x	x	x	x	x	-	-	-	x	-	x	x	x	-	-
23MCC01.CO5	x	x	x	-	-	-	-	-	x	x	-	x	x	-	-

Unit-I SOFTWARE PROJECT MANAGEMENT CONCEPTS 9

Introduction to Software Project Management-In Overview of Project Planning- Select Project- Identifying Project scope and objectives-infrastructure- project products and Characteristics. Estimate efforts- Identify activity risks and allocate resources- TQM- 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.

Unit-IV 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 internet on project management – managing projects for the internet – effect on project management activities-Comparison of project management software's- dot Project-Launch pad- open Proj. Case study: PRINCE2.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bob Hughes& Mike Cotterell	Software Project Management	Tata McGraw Hill Publications, Fifth Edition	2012
2.	Futrell	Quality Software Project Management	Pearson Education India	2008
3.	Gobalswamy Ramesh	Managing Global Software Projects	Tata McGraw Hill Publishing Company	2003

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Richard H.Thayer	Software Engineering Project Management	IEEE Computer Society	2004
2.	S.A. Kelkar	Software Project Management	PHI, New Delhi,Third Edition	2013

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23MCC02	WEB TECHNOLOGIES	L	T	P	C
		3	0	0	3

Course Objective:

- To understand the concepts and architecture of the World Wide Web.
- To understand the basic network concepts.
- To understand and practice mark up languages
- To understand and practice embedded dynamic scripting on client side Internet Programming
- To understand and practice web development techniques on client-side

Course Outcomes:

23MCC02.CO1 Acquire knowledge about functionalities of world wide web

23MCC02.CO2 Explore markup languages features and create interactive web pages using them

23MCC02.CO3 Learn and design Client side validation using scripting languages

23MCC02.CO4 Acquire knowledge about Open source JavaScript libraries

23MCC02.CO5 Able to design front end web page and connect to the back end databases

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC02.CO1	x	x	x	x	x	x	-	-	x	-	x	x	x	x	-
23MCC02.CO2	x	-	x	x	x	-	-	-	-	x	x	x	x	x	-
23MCC02.CO2	x	x	x	-	x	x	-	-	x	x	x	-	x	-	-
23MCC02.CO4	x	x	x	x	-	-	-	-	-	x	-	x	x	x	-
23MCC02.CO5	x	x	-	x	x	x	-	-	x	-	x	x	x	x	-

Unit-I INTRODUCTION TO WWW **9**

Internet Standards – Introduction to WWW – WWW Architecture – FTP – Overview of HTTP – HTTP request, response –Generation of dynamic web pages.

Unit-II BASIC CONCEPTS OF NETWORKS & WEB **9**

TCP & UDP Protocols - OSI Reference Model – TCP / IP Protocol Architecture – URI – MIME – Common Gateway Interface – Remote Login – PERL – SGML

Unit-III USER INTERFACE DESIGN **9**

Mark up Language (HTML): Introduction to HTML & HTML 5 – Headings, Paragraphs line breaks etc – Frames – Tables – Lists – images.Cascading Style sheets – The need for CSS – Introduction to CSS – Internal & External style sheets– Inline style sheets – Web Browser Architecture.

Unit-IV INTRODUCTION TO JAVASCRIPT **9**

Introduction - Core features - Data types and Variables - Operators, Expressions, and Conditional Statements - Functions - Objects - Document Object Model – Loops – Java Script and Form Processing.

Unit-V AJAX & PHP **9**

AJAX: Introduction – Working of AJAX – AJAX Coding.PHP : Introduction – How web works - Setting up the environment (LAMP server) - Programming basics - Control structures and looping structures – Functions – Reading Data in Web Pages - Embedding PHP within HTML - Establishing connectivity with MySQL database.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Harvey &PaulDeitel& Associates, Harvey Deitel and Abbey Deitel	Internet and World Wide	Pearson Education	2011
2.	Achyut S Godbole and AtulKahate	Web- How To Program Web Technologies	Tata McGrawHill	2012
3.	Steven Holzner	The Complete Reference-PHP	Tata McGrawHill	2008

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Thomas A Powell, Fritz Schneider	JavaScript: The Complete Reference	Tata McGrawHill	2013
2.	David Flanagan	JavaScript: The Definitive Guide	O'ReillyMedia	2011
3.	Mike Mcgrath.	PHP & MySQL in easy Steps	Tata McGrawHill	2012

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23MCC03	E-LEARNING	L	T	P	C
		3	0	0	3

Course Objective:

- To learn the various E-learning approaches and Components.
- To explore Design Thinking.
- To understand the types of design models of E-learning.
- To learn about E-learning Authoring tools.
- To know about evaluation and management of E-learning solutions

Course Outcomes:

23MCC03.CO1 Distinguish the phases of activities in models of E-learning.

23MCC03.CO2 Identify appropriate instructional methods and delivery strategies.

23MCC03.CO3 Choose appropriate E-learning Authoring tools.

23MCC03.CO4 Create interactive E-learning courseware.

23MCC03.CO5 Distinguish the phases of activities in models of E-learning.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC03.CO1	x	x	x	-	-	-	-	-	-	-	-	x	x	-	-
23MCC03.CO2	x	x	x	-	-	x	-	-	-	x	-	x	x	-	-
23MCC03.CO2	x	x	x	-	x	x	-	-	x	x	-	x	x	-	-
23MCC03.CO4	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCC03.CO5	x	x	x	-	-	-	-	-	x	x	-	x	x	-	-

Unit-I INTRODUCTION 9

Need for E-Learning – Approaches of E-Learning – Components of E-Learning –synchronous and Asynchronous Modes of Learning – Quality of E-Learning – Blended Learning: Activities, Team and Technology – Work Flow to Produce and Deliver E-Learning Content – Design Thinking: Introduction– Actionable Strategy– Actto Learn – Leading Teams to Win.

Unit-II DESIGNING E-LEARNING COURSE CONTENT 9

Design Models of E-Learning – Identifying and Organizing E-Learning Course Content: Needs Analysis – Analyzing the Target Audience–Identifying Course Content–Defining Learning Objectives–Defining the Course Sequence – Defining Instructional Methods –Defining Evaluation and Delivery Strategies – Case Study.

Unit-III CREATING INTERACTIVE CONTENT 9

Preparing Content: Tips for Content Development and Language Style – Creating Storyboards: Structure of an Interactive E-Lesson–Techniques for Presenting Content –Adding Examples –Integrating Multimedia Elements – Adding Examples – Developing Practice and Assessment Tests–Adding Additional Resources–Courseware Development Authoring Tools – Types of Authoring Tools – Selecting an Authoring Tool.

Unit-IV LEARNING PLATFORMS 9

Types of Learning Platforms – Proprietary Vs.Open– Source LMS – LMS Vs LCMS – Internally Handled and Hosted LMS – LMS Solutions – Functional Areas of LMS.

Unit-V COURSE DELIVERY AND EVALUATION 9

Components of an Instructor-Ledor Facilitated Course–Planning and Documenting Activities–Facilitating Learners Activities –E-Learning Methods and Delivery Formats –Using Communication Tools for E-Learning – Course Evaluation.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Clark,R.C.,Mayer,R. E	E-Learning and the Science of Instruction	McGrawHill, Third Edition	2011
2.	Crews,T.B.,Sheth,S. N., Horne, T	Understanding the Learning Personalities of Successful Online Students	1st Edition, Educause Review	2014

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Johnny Schneider	Understanding Design Thinking, Lean and Agile	1st Edition, O'Reilly Media	2017
2.	Madhuri Dubey	Effective E–learning Design, Development and Delivery	1stEdition, University Press	2011

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23MCC04	SOFTWARE QUALITY AND TESTING	L	T	P	C
		3	0	0	3

Course Objective:

- To know the behavior of the testing techniques and to design test cases to detect the errors in the software
- To get insight into software testing methodologies
- To understand standard emerging areas in testing
- To learn about the software quality models.
- To understand the models and metrics of software quality and reliability.

Course Outcomes:

23MCC04.CO1	Up on completion of the course the students will be able to choose the software testing techniques to cater to the need of the project
23MCC04.CO2	Identify the components of software quality assurance systems
23MCC04.CO3	Apply various software testing strategies
23MCC04.CO4	Design and develop software quality models
23MCC04.CO5	Make use of statistical methods in software quality.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC04.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCC04.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC04.CO2	x	x	x	x	x	x	x	-	x	x	x	x	x	-	-
23MCC04.CO4	x	x	x	x	x	x	x	-	x	x	x	x	x	-	-
23MCC04.CO5	x	x	x	-	x	x	x	-	x	x	x	x	x	-	-

Unit-I INTRODUCTION 9

Basic concepts and Preliminaries – Theory of Program Testing– UNIT Testing – Control Flow Testing –Data Flow Testing– System Integration Testing

Unit-II SOFTWARE TESTING METHODOLOGY 9

Software Test Plan–Components of Plan - Types of Technical Reviews - Static and Dynamic Testing- – Software Testing in Spiral Manner - Information Gathering - Test Planning - Test Coverage - Test Evaluation -Prepare for Next Spiral - Conduct System Test -Acceptance Test – Summarize Testing Results.

Unit-III EMERGING SPECIALIZED ARE AS IN TESTING 9

Test Process Assessment – Test Automation Assessment - Test Automation Framework –Nonfunctional Testing – SOA Testing – Agile Testing – Testing Center of Excellence –Onsite/Offshore Model - Modern Software Testing Tools – Software Testing Trends –Methodology to Develop Software Testing Tools.

Unit-IV SOFTWARE QUALITY MODELS 9

Software quality –Verification versus Validation– Components of Quality Assurance – SQA Plan – Quality Standards – CMM – PCMM – CMMI – Malcolm Baldrige National Quality Award.

Unit-V QUALITY THROUGH CONTINUOUS IMPROVEMENT PROCESS 9

Role of Statistical Methods in Software Quality – Transforming Requirements into Test Cases– Deming's Quality Principles – Continuous Improvement through Plan Do Check Act(PDCA)

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of publication
1.	William E.Lewis	Software Testing and Continuous Quality Improvement	3rd Edition, Auerbach Publications	2011
2.	Kshirasagar Naik and Priyadarshi Tripathy	Software Testing and Quality Assurance Theory and Practice	2nd Edition, John Wiley & Sons Publication	2011
3.	RonPatton	Software Testing	2nd Edition, Pearson Education	2007

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Glenford J. Myers, Tom Badgett,Corey Sandler	The Art of Software Testing	3rd Edition, John Wiley& Sons Publication	2012
2.	Paul C.Jorgensen	Software Testing, A Craftman'sApproach	CRC PressTaylor&Francis Group, Fourth Edition	2018

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23MCC05	ADVANCES IN OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

Course Objective:

- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- To know the components and management aspects of Real time, Mobile operating systems

Course Outcomes:

23MCC05.CO1	Discuss the various synchronization, scheduling and memory management issues
23MCC05.CO2	Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
23MCC05.CO3	Discuss the various resource management techniques for distributed systems
23MCC05.CO4	Identify the different features of real time and mobile operating systems
23MCC05.CO5	Install and use available open source kernel

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC05.CO1	x	x	x	-	-	-	-	-	x	-	-	x	x	-	-
23MCC05.CO2	x	x	x	-	-	-	-	x	x	x	-	x	x	-	-
23MCC05.CO2	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC05.CO4	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC05.CO5	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-

Unit-I FUNDAMENTALS OF OPERATING SYSTEMS 9

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

Unit-II DISTRIBUTED OPERATING SYSTEMS 9

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

Unit-III DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Non blocking Commit Protocol – Security and Protection

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 – Micro Kernel 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 Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of publication
1.	Abraham Silberschatz, Peter Baer Galvin,	Operating System Concepts-Essentials	JohnWiley&Sons	2013
2.	Mukesh Singhal, Niranjan G.Shivaratri,	Advanced Concepts in Operating Systems–Distributed,Database, and Multiprocessor Operating Systems	TATA McGrawHill	1994

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Love Robert	Linux Kernel Development	Pearson Education	2018
2.	RajibMall	Real-Time Systems:Theory and Practice	Pearson Education	2006
3.	Daniel P Bovet and Marco Cesatin	Understanding the Linux kernel	O'Reilly	2005

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23MCB17	MOBILE COMPUTING	L	T	P	C
		3	0	0	3

Course Objective:

- To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture.
- To have an exposure about wireless protocols -WLN, Bluetooth, WAP, ZigBee issues
- To Know the Network, Transport Functionalities of Mobile communication.
- To impart knowledge about Mobile Application Development Platform
- To impart the knowledge about basic components needed for Mobile App development

Course Outcomes:

23MCB17.CO1 Gain the knowledge about various types of Wireless Data Networks and Voice Networks

23MCB17.CO2 Understand the architectures,the challenges and the Solutions of Wireless Communication

23MCB17.CO3 Realize the role of Wireless Protocols in shaping the future Internet.

23MCB17.CO4 Able to develop simple Mobile Application Using Android

23MCB17.CO5 Able to develop simple Mobile Application Using Android

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB17.CO1	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
23MCB17.CO2	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
23MCB17.CO2	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
23MCB17.CO4	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
23MCB17.CO5	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-

Unit-I LOGIC AND PROOFS WIRELESS COMMUNICATION FUNDAMENTALS ARCHITECTURE 9

Frequency Spectrum- Multiplexing- Spread spectrum-GSM vs CDMA - -Comparison of 2G , 3 G, 4G - GSM Architecture-Entities-Call Routing- Address and identifiers- GSM Protocol architecture-Mobility Management-Frequency Allocation- Security –GPRS Architecture (entity and Protocol).

Unit-II MOBILE WIRELESS SHORT RANGE NETWORKS 9

Introduction-WLAN Equipment-WLAN Topologies-WLAN Technologies-IEEE 802.11 Architecture-WLAN MAC-Security of WLAN, Power Management-Standards- WAP Architecture- Bluetooth enabled Devices Network-Layers in Bluetooth Protocol-Security in Bluetooth- IrDA- ZigBee.

Unit-III MOBILE IP NETWORK LAYER, TRANSPORT LAYER 9

IP and Mobile IP Network Layer- Packet delivery and Handover Management-Location Management-Registration- Tunneling and Encapsulation-Route Optimization- Mobile Transport Layer-Conventional TCP/IP Transport Layer Protocol-Indirect, Snooping, Mobile TCP.

Unit-IV MOBILE APPLICATION DEVELOPMENT USING ANDROID 9

Mobile Applications Development - Understanding the Android Software Stack – Android Application Architecture –The Android Application Life Cycle – The Activity Life Cycle-Creating Android Activity - Views-Layout -Creating User Interfaces with basic views- linking activities with Intents.

Unit-V MOBILE APPLICATION DEVELOPMENT USING ANDROID 9

Services-Broadcast Receivers – Adapters – Data Storage, Retrieval and Sharing.-Location based services-Development of simple mobile applications.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Asoke K Talukder, HasanAhmed, RoopaR Yavagal	Mobile Computing	Tata McGrawHill	2010
2.	BarryA.Burd	Android Application Development For Dummies All in One	Wiley	2015
3.	EdBurnette,"Hello	Android:Introducing Google"s Mobile Development Platform	Pragmatic Programmers	2012

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	RajKamal	Mobile Computing	Oxford Higher Education	2012
2.	Raj Kamal Mobile Computing Oxford Higher Education 2012	ProfessionalAndroid2Application Development, Wrox"s Programmer to Programmer series.	Mc GrawHill Professional	2012

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23MCB19	MOBILE APPLICATION DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2

Course Objective:

- To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture.
- To have an exposure about wireless protocols -WLN, Bluetooth, WAP, ZigBee issues.
- To Know the Network, Transport Functionalities of Mobile communication.
- To impart knowledge about Mobile Application Development Platfor
- To impart the knowledge about basic components needed for Mobile App development

Course Outcomes:

23MCB19.CO1 Gain the knowledge about various types of Wireless Data Networks and Voice Networks

23MCB19.CO2 Understand the architectures,the challenges and the Solutions of Wireless Communication

23MCB19.CO3 Realize the role of Wireless Protocols in shaping the future Internet.

23MCB19.CO4 Able to develop simple Mobile Application Using Android

23MCB19.CO5 Able to develop Advanced Mobile Application Using Android

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB19.CO1	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
23MCB19.CO2	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
23MCB19.CO2	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
23MCB19.CO4	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
23MCB19.CO5	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-

Sl.No.	List of Experiments
1.	Develop an application that uses Layout Managers.
2.	Develop an application that uses event listeners.
3.	Develop an application that uses Adapters ,Toast.
4.	Develop an application that makes use of database.
5.	Develop an application that makes use of RSS Feed.
6.	Implement an application that implements Multi threading.
7.	Develop a native application that uses GPS location information.
8.	Implement an application that writes data to the SD card.
9.	Implement an application that creates an alert upon receiving a message.
10.	Develop a game application.

Total Periods: 45

23MCB18	NETWORK PROGRAMMING	L	T	P	C
		3	0	0	3

Course Objective:

- To understand inter process and inter-system communication
- To understand socket programming in its entirety
- To understand usage of TCP/UDP / Raw sockets
- To understand how to build network applications

Course Outcomes:

23MCB18.CO1 To write socket API based programs

23MCB18.CO2 To design and implement client-server applications using TCP sockets

23MCB18.CO3 To design and implement client-server applications using UDP sockets

23MCB18.CO4 To design and implement client-server application using HTTP protocol

23MCB18.CO5 To analyze network programs

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB18.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCB18.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB18.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB18.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCB18.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

Unit-I INTRODUCTION 9

Overview of UNIX OS - Environment of a UNIX process - Process control – Process relationships-Signals – Interprocess Communication- overview of TCP/IP protocols

Unit-II ELEMENTARY TCP SOCKETS 9

Introduction to Socket Programming –Introduction to Sockets – Socket address Structures – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write , close functions – Iterative Server – Concurrent Server.

Unit-III APPLICATION DEVELOPMENT 9

TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients –boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots,Server Shutdown – I/O multiplexing – I/O Models – select function – shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing)

Unit-IV SOCKET OPTIONS, ELEMENTARY UDP SOCKETS 9

Socket options – getsocket and setsocket functions – generic socket options – IP socketoptions –ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function –getservbyname and getservbyport functions.

Unit-V ADVANCED SOCKETS 9

Ipv4 and Ipv6 interoperability – threaded servers – thread creation and termination – TCP echo server using threads – Mutexes – condition variables – raw sockets – raw socket creation – raw socket output – raw socket input – ping program – trace route program.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	W.Richard Stevens, B.Fenner,A.M. Rudoff	Unix Network Programming–The Sockets Networking API	Pearson	2004
2.	W.Richard Stevens, S.ARago	Programming in the Unix environment	Pearson	2005

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	W.Richard Stevens, B.Fenner,A.M. Rudoff	Unix Network Programming–The Sockets Networking API	Pearson	2004
2.	W.Richard Stevens, S.ARago	Programming in the Unix environment	Pearson	2005

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23MCB20	NETWORK PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

Course Objective:

- To understand inter process and inter-system communication
- To understand socket programming in its entirety
- To understand usage of TCP/UDP / Raw sockets
- To understand how to build network applications

Course Outcomes:

23MCB20.CO1 To write socket API based programs

23MCB20.CO2 To design and implement client-server applications using TCP sockets

23MCB20.CO3 To design and implement client-server applications using UDP sockets

23MCB20.CO4 To design and implement client-server application using HTTP protocol

23MCB20.CO5 To analyze network programs

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCB20.CO1	x	x	x	x	x	x	-	-	x	x	-	x	x	x	-
23MCB20.CO2	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
23MCB20.CO2	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
23MCB20.CO4	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
23MCB20.CO5	x	x	x	x	x	x	-	-	x	x	-	x	x	x	-

Sl.No.	List of Experiments
1.	Implementation of File System Calls
2.	Implementation of ICP Techniques–Pipe, Message Queue, Shared Memory
3.	Socket Programming a)TCP Sockets b)UD PSockets
4.	Applications using Sockets
5.	Simulation of Sliding Window Protocol
6.	Simulation of Routing Protocols
7.	Remote Procedure Calls
8.	Development of applications such as DNS/HTTP/E-mail/Multi-user chat

Total Periods: 45

23MCC06	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.

Course Outcomes:

23MCC06.CO1	Develop a set of risk and security requirements to ensure that there are no gaps in an organization's security practices.
23MCC06.CO2	Achieve management, operational and technical means for effective cyber security.
23MCC06.CO3	Audit and monitor the performance of cyber security controls.
23MCC06.CO4	To spot gaps in the system and devise improvements30
23MCC06.CO5	Identify and report vulnerabilities in the system

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC06.CO1	x	x	x	x	x	x	-	-	x	-	x	x	x	x	-
23MCC06.CO2	x	x	x	x	x	x	x	-	-	x	x	x	x	x	-
23MCC06.CO2	x	x	x	-	x	x	-	x	x	x	-	-	x	-	-
23MCC06.CO4	x	x	x	x	-	-	x	-	-	x	-	x	x	x	-
23MCC06.CO5	x	x	x	x	x	x	x	-	x	-	x	x	x	x	-

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 Policy-Security Management Best Practices

Unit-II SECURITY CONTROLS 9

People Management-Human Resource Security-Security Awareness and Education Information Management-Information Classification and handling-Privacy-Documents and Record Management-Physical Asset Management- Office Equipment-Industrial Control Systems-Mobile Device Security- System Development-Incorporating Security into SDLC Case study on information security policies.

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 Management-Virtual Servers-Network Storage Systems- Network Management Concepts-Firewall-IP Security-Electronic 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 Management-Vulnerability Management-Security Event Management-Forensic Investigations-Local Environment Management-Business Continuity. – Case study on cloud and crypto graphic vulnerabilities.

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 Practices. – Case study on vulnerability assessment using ACUNETIX

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Effective Cyber Security-A guide to using Best Practices and Standards	Addison-Wesley Professional	2018

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gregory J.Touhilland C.JosephTouhill	Cyber Security for Executives-A Practical guide	Wiley Publications	2014
2.	RaefMeeuwisse	Cyber Security for Beginners	Cyber Simplicity Ltd,	2017

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23MCC07	C# AND .NET PROGRAMMING	L	T	P	C
		3	0	0	3

Course Objective:

- To learn the technologies of the .NET framework.
- To cover all segments of programming in C# starting from the language basis, followed by the object oriented programming concepts.
- To update and enhance skills in writing Windows applications, ADO.NET and ASP .NET.
- To introduce advanced topics namely data connectivity, WPF, WCF and WPF with C# and .NET 4.5.
- To implement mobile applications using .Net Compact Framework

Course Outcomes:

23MCC07.CO1 Understand the difference between .NET and Java framework.

23MCC07.CO2 Work with the basic and advanced features of C# language.

23MCC07.CO3 Create applications using various data providers.

23MCC07.CO4 Create web application using ASP.NET.

23MCC07.CO5 Create mobile application using .NET compact framework

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC07.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCC07.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC07.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC07.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC07.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

Unit-I C# LANGUAGE BASICS 9

.Net Architecture – Core C# – Variables – Data Types – Flow control – Objects and Types Classes and Structs – Inheritance- Generics – Arrays and Tuples – Operators and Casts – Indexers- Assemblies – Shared Assemblies – CLR Hosting – Appdomains.

Unit-II C# ADVANCED FEATURES 9

Diagnostics Tasks – Threads and Synchronization – Manipulating XML – SAX and DOM – Manipulating files and the Registry – Transactions – Data access with ADO.NET: Introduction, LINQ to Entities and the ADO.NET Entity Framework, Querying a Database with LINQ – Creating the ADO.NET Entity Data Model Class Library, Creating a Windows Forms Project – Data Bindings between Controls and the Entity Data Model – Dynamically Binding Query Results.

Unit-III BASE CLASS LIBRARIES AND DATA MANIPULATION 9

Diagnostics Tasks – Threads and Synchronization – Manipulating XML – SAX and DOM – Manipulating files and the Registry – Transactions – Data access with ADO.NET: Introduction, LINQ to Entities and the ADO.NET Entity Framework, Querying a Database with LINQ – Creating the ADO.NET Entity Data Model Class Library, Creating a Windows Forms Project – Data Bindings between Controls and the Entity Data Model – Dynamically Binding Query Results.

Unit-IV WINDOW AND WEB BASED APPLICATIONS 9

Window Based Applications – Core ASP.NET – ASP.NET Web Forms – Server Controls, Data Binding – ASP.NET State Management, Tracing, Caching, Error Handling, Security, Deployment, User and Custom Controls – Windows Communication Foundation (WCF) – Introduction to Web Services.

Unit-V .NET COMPACT FRAMEWORK 9

Reflection – .Net Remoting-.Net Security – Localization – Peer-to-Peer Networking – Building P2P Applications – .Net Compact Framework – Compact Edition DataStores – Testing and Debugging – Optimizing performance – Packaging and Deployment.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Christian Nagel, Bill Evjen,Jay Glynn,Karli Watson,Morgan Skinner	Professional C# and .NET 4.5	Wiley	2012
2.	Andrew Troelsen	Pro C#5.0 and the .NET4.5 Framework	Apress publication	2012
3.	Ian Gariffiths,Mathew Adams, Jesse Liberty	Programming C# 4.0	O'Reilly	2010

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Andy Wigley, Daniel Moth	Peter Foot,—Mobile Development Handbook	Microsoft Press	2011
2.	Herbert Schildt	C#- The Complete Reference	TataMcGrawHill	2010

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23MCC08	WIRELESS NETWORKING	L	T	P	C
		3	0	0	3

Course Objective:

- To understand the concept about Wireless networks, protocol stack and standards
- To study about fundamentals of 3G Services, its protocols and applications
- 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

Course Outcomes:

23MCC08.CO1	Conversant with the latest 3G/4G networks and its architecture
23MCC08.CO2	Design and implement wireless network environment for any application using latest wireless protocols and standards
23MCC08.CO3	Ability to select the suitable network depending on the availability and requirement
23MCC08.CO4	Implement different type of applications for smart phones and mobile devices with latest network strategies
23MCC08.CO5	Conversant with the latest 3G/4G networks and its architecture

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC08.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCC08.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC08.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC08.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC08.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

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: Routing: Destination Sequence distance vector, 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, TD-CDMA, 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 Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jochen Schiller	Mobile Communications	Pearson Education	2012
2.	Vijay Garg	Wireless Communications and networking	Elsevier	2007
3.	Afif Osseiran, Jose.F.Monserrat and Patrick Marsch	5G Mobile and Wireless Communications Technology	Cambridge University Press	2016

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	ClintSmith, Daniel Collins	Wireless Networks	McGraw-Hill Education	2014
2.	Anurag Kumar, D.Manjunath,Joykuri	Wireless Networking	Elsevier	2011
3.	Xiang,W;Zheng,K; Shen, X.S	5G Mobile Communications	Springer	2016

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23MCC09	WEB DESIGN	L	T	P	C
		3	0	0	3

Course Objective:

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice markup languages
- To understand and practice embedded dynamic scripting on client-side Internet Programming
- To understand and practice web development techniques on client-side.
- The objective is to enable the students to understand the Organizational Behaviour, and Organizational Change and dynamic of groups.

Course Outcomes:

23MCC09.CO1 Create a basic website using HTML and Cascading Style Sheets.

23MCC09.CO2 Create websites with complex layouts

23MCC09.CO3 Add interactivity to websites using simple scripts

23MCC09.CO4 Design rich client presentation using AJAX.

23MCC09.CO5 Add business logic to websites using PHP and databases

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC09.CO1	x	x	x	x	x	x	-	-	x	-	x	x	x	x	-
23MCC09.CO2	x	-	x	x	x	-	-	-	-	x	x	x	x	x	-
23MCC09.CO2	x	x	x	-	x	x	-	-	x	x	x	-	x	-	-
23MCC09.CO4	x	x	x	x	-	-	-	-	-	x	-	x	x	x	-
23MCC09.CO5	x	x	-	x	x	x	-	-	x	-	x	x	x	x	-

Unit-I INTRODUCTION TO WWW 9

Understanding the working of Internet-Web Application Architecture-Brief history of Internet Web Standards – W3C- Technologies involved in Web development – Protocols-Basic Principles involved in developing a website-Five Golden Rules of Web Designing

Unit-II UI DESIGN 9

HTML Documents-Understanding markup languages-Structure of HTML Documents-Markup Tags-Basic markup tags- Working with Text-Working with Images-Hyperlinks -Images Tables-List-SVG-Advanced HTML- Iframes-HTML5 Video and Audio tags Cascading Style Sheet: Need for CSS - Importance of separating document structuring and styling-Basic CSS selectors and properties-CSS properties for text (Color, font, weight, align, etc.) and working with colors-Selecting with classes, IDs, tags-CSS Specificity-Ways of linking CSS to HTML-CSS Pseudo selectors- Understanding the box model - Margins, padding and border – Inline and block elements - Structuring pages using Semantic Tags

Unit-III WEB PAGE LAYOUTS WITH CSS3 9

Positioning with CSS – Positions, Floats, z-index-Layouts with Flexbox –Responsive web design with media queries- Advanced CSS Effects – Gradients, opacity, box-shadow-CSS3 Animations – Transforms and Transitions-CSS Frameworks – Bootstrap

Unit-IV JAVA SCRIPT 9

Basic JavaScript syntax-JavaScript Objects and JSON-Understanding the DOM-JavaScript Events and Input validation- Modifying CSS of elements using JavaScript-JavaScript Local Storage and Session Storage-Cross domain data transfer with AJAX-Using JQuery to add interactivity-JQuery Selectors-JQuery Events-Modifying CSS with JQuery -Adding and removing elements with JQuery-AJAX with JQuery-Animations with JQuery (hide,

show, animate, fade methods, Slide Method)

Unit-V SERVER-SIDE PROGRAMMING WITH PHP 9

PHP basic syntax-PHP Variables and basic data structures-Using PHP to manage form submissions-File Handling - Cookies and Sessions with PHP-Working with WAMP and PHPMYADMIN-Establishing connectivity with MySQL using PHP

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David Flanagan	JavaScript:The Definitive Guide	7thEdition,O'Reilly Publications	2020
2.	Danny Goodman	Dynamic HTML: The Definitive Reference:A Comprehensive-resourcefulness,CSS,DOM, JavaScript	O'ReillyPublications, 3rd Edition	2007
3.	Robin Nixon	Learning PHP, MySQL, JavaScript& CSS: A Step-by-Step Guide to Creating Dynamic Websites	O'ReillyPublications, 2nd Edition	2018

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Keith J Grant	CSS in Depth	Manning Publications. 1st edition	2018
2.	Elizabeth Castrol	HTML5 & CSS3 Visual Quickstart Guide	Peachpit Press,7th Edition	2012

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23MCC10 **NETWORK PROGRAMMING AND SECURITY**

L	T	P	C
3	0	0	3

Course Objective:

- To understand the basics of Network Programming
- To be familiar with building network applications
- To design and implement client server Applications using TCP and UDP Sockets
- To expose with various socket options
- To get aware of Network security for Network Programming

Course Outcomes:

23MCC10.CO1	Design and implement the client/server programs using variety of protocols
23MCC10.CO2	Understand the key protocols which support Internet
23MCC10.CO3	Demonstrate advanced knowledge of programming interfaces for network communication
23MCC10.CO4	Use the basic tools for design and testing of network programs in Unix environment
23MCC10.CO5	Identify some of the factors driving the need for network security

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC10.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCC10.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC10.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC10.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC10.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

Unit-I INTRODUCTION **9**

TCP/IP Layer Model – Multicast, broadcast and Any cast - Socket address Structures – Byteordering functions – address conversion functions – Elementary TCP Sockets – socket,connect, bind, listen, accept, read, write , close functions – Iterative Server – ConcurrentServer.

Unit-II ELEMENTARY TCP SOCKETS **9**

TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients –boundary conditions: Server process Crashes, Server host Crashes, Server Crashes andreboots, Server Shutdown.

Unit-III SOCKET OPTIONS AND MULTIPLEXING **9**

Socket options – getsocket and setsocket functions – generic socket options – IP socketoptions – ICMP socket options – TCP socket options I/O multiplexing – I/O Models – selectfunction – shutdown function – TCP echo Server (with multiplexing) – poll function – TCPecho Client (with Multiplexing).

Unit-IV ELEMENTARY UDP SOCKETS **9**

UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function –getservbyname and getservbyport functions.

Unit-V NETWORK SECURITY **9**

SSL - SSL Architecture, SSL Protocols, SSL Message , Secure Electronic Transaction(SET). TLS –TLS Protocols,DTLS Protocols, PKI – Fundamentals, Standards andApplications.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	W.Richard Stevens, Bill Fenner,Andrew M.Rudoff	Unix Network Programming, Volume1:The Sockets Networking API	Addison Wesley Pearson Education	2004
2.	Behrouz A Forouzan,Debdeep Mukhopadhyay	Cryptography and Network Security	Tata McGrawHill Education Private Limit	2010
3.	William Stallings	Cryptographic and network security Principles and Practices	Prentice Hall	2005

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	AndrePerez	Network Security	Publisher JohnWiley&Sons	2014
2.	LewisVan Winkle	Hands-On Network Programming with C: Learn socket programming in C and write secure and optimized network code	Packet Publishing	2019

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23MCC11	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

Course Outcomes:

23MCC11.CO1	Distributed systems in Cloud Environment
23MCC11.CO2	Calculate the main concepts, key technologies, strengths and limitations of Cloud computing
23MCC11.CO3	Tiy the Architecture, Infrastructure and delivery models of Cloud computing
23MCC11.CO4	All, choose and use the appropriate current technology for the implementation of Cloud
23MCC11.CO5	Adopt Micro services and DevOps in Cloud environment

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC11.CO1	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC11.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC11.CO2	x	x	x	-	-	x	-	-	x	x	x	x	x	-	-
23MCC11.CO4	x	x	x	-	-	x	-	-	x	x	x	x	x	-	-
23MCC11.CO5	x	x	x	-	-	-	-	-	x	x	x	x	x	-	-

Unit-I DISTRIBUTED SYSTEMS 9

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

Unit-II INTRODUCTION TO CLOUD COMPUTING 9

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

Unit-III CLOUD INFRASTRUCTURE 9

Cloud Architecture and Design – Architectural design challenges – Technologies for Networkbased system - NIST Cloud computing Reference Architecture – Public, Private and Hybridclouds – Cloud Models : IaaS, PaaS and SaaS – Cloud storage providers – EnablingTechnologies for the Internet of Things – Innovative Applications of the Internet of Things.

Unit-IV CLOUD ENABLING TECHNOLOGIES 9

Service Oriented Architecture – Web Services – Basics of Virtualization – Emulation – Typesof 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 Micro services - Emergence of Micro service Architecture – Design patterns of Micro services – The Mini web service architecture – Micro service dependency tree –Challenges with Micro services - SOA vs-micro service – Micro service and API – Deploying and maintaining Micro services – Reason for having DevOps – Overview of DevOps –History of DevOps – Concepts and terminology in DevOps – Core elements of DevOps –Life cycle of DevOps – Adoption of DevOps - DevOps Tools – Build, Promotion and Deployment in DevOps - DevOps in Business Enterprises.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	KaiHwang,Geoffrey C.Fox &Jack G.Dongarra	Distributed and Cloud computing, From Parallel Processing to the Internet of Things	MorganKaufmann Publishers	2012
2.	Andrew S. Tanenbaum&Maarten Van Steen	Distributed Systems-Principles and paradigms	Second Edition,Pearson Prentice Hall	2006
3.	Thomas Erl, Zaigham Mahood&Ricardo Puttin	Cloud Computing, Concept,Technology&Architecture	Prentice Hall,Second Edition	2013

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Richard Rodger	The Tao of Micro services	Manning Publications,1st Edition, December	2017
2.	Magnus Larsson	Hands-On Micro services with Spring Boot and Spring Cloud: Build and deploy micro services using spring cloud, Istio and kubernetes	Packet Publishing Ltd,First Edition,September	2019

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23MCC12	BIO INSPIRED COMPUTING	L	T	P	C
		3	0	0	3

Course Objective:

- To Learn bio-inspired theorem and algorithms
- To Understand random walk and simulated annealing
- To Learn genetic algorithm and differential evolution
- To Learn swarm optimization and ant colony for feature selection
- To understand bio-inspired application in various fields

Course Outcomes:

23MCC12.CO1	Implement and apply bio-inspired algorithms
23MCC12.CO2	Explain random walk and simulated annealing
23MCC12.CO3	Implement and apply genetic algorithms
23MCC12.CO4	Explain swarm intelligence and ant colony for feature selection
23MCC12.CO5	Apply bio-inspired techniques in various fields

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC12.CO1	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCC12.CO2	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCC12.CO2	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCC12.CO4	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCC12.CO5	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-

Unit-I INTRODUCTION 9

Introduction to algorithm - Newton ' s method - optimization algorithm - No-Free-LunchTheorems - Nature-Inspired Metaheuristics -Analysis of Algorithms -Nature InspiresAlgorithms -Parameter tuning and parameter control.

Unit-II RANDOM WALK AND ANEALING 9

Random variables - Isotropic random walks - Levy distribution and flights - Markov chains -step sizes and search efficiency - Modality and intermittent search strategy - importance ofrandomization- Eagle strategy-Annealing and Boltzmann Distribution - parameters –SAalgorithm -Stochastic Tunneling.

Unit-III GENETIC ALGORITHMS AND DIFFERENTIAL EVOLUTION 9

Introduction to genetic algorithms and - role of genetic operators - choice of parameters – GAvarients - schema theorem - convergence analysis - introduction to differential evolution -varients - choice of parameters - convergence analysis - implementation.

Unit-IV SWARM OPTIMIZATION AND FIREFLY ALGORITHM 9

Swarm intelligence - PSO algorithm - accelerated PSO - implementation – convergenceanalysis - binary PSO - The Firefly algorithm - algorithm analysis - implementation - variants-Ant colony optimization toward feature selection.

Unit-V APPLICATIONS OF BIO INSPIRED COMPUTING 9

Improved Weighted Thresholded Histogram Equalization Algorithm for Digital ImageContrast Enhancement Using Bat Algorithm - Ground Glass Opacity Nodules Detection andSegmentation using Snake Model - Mobile Object Tracking Using Cuckoo Search- Bioinspired algorithms in cloud computing- Wireless Sensor Networks using Bio inspiredAlgorithms.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Eiben,A.E.Smith,JamesE	Introduction to Evolutionary Computing,	Springer	2015
2.	Helio J.C.Barbosa	Ant Colony Optimization – Techniques and Applications	Intech	2013

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Xin-SheYang, Jaao Paulopapa	Bio-Inspired Computing and Applications in Image Processing	Elsevier	2016
2.	Xin-SheYang	Nature Inspired Optimization Algorithm	Elsevier	2014

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23MCC13	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

Course Outcomes:

23MCC13.CO1	Build an Information Retrieval system using the available tools.
23MCC13.CO2	Identify and design the various components of an Information Retrieval system.
23MCC13.CO3	Model an information retrieval system
23MCC13.CO4	Apply machine learning techniques to text classification and clustering which is use Information Retrieval.
23MCC13.CO5	Design an efficient search engine and analyze the Web content structure

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC13.CO1	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCC13.CO2	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCC13.CO2	x	x	x	-	x	-	-	-	x	-	-	x	x	-	-
23MCC13.CO4	x	x	x	-	x	-	-	-	x	-	-	x	x	-	-
23MCC13.CO5	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-

Unit-I INTRODUCTION: MOTIVATION **9**

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

Unit-II MODELING **9**

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model – TermWeighting – Scoring and Ranking –Language Models – Set Theoretic Models – ProbabilisticModels – 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 –QueryLanguages – Query Processing - Relevance Feedback and Query Expansion – AutomaticLocal and Global Analysis – Measuring Effectiveness and Efficiency.

Unit-IV CLASSIFICATION AND CLUSTERING **9**

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

Unit-V SEARCHING THE WEB **9**

Searching the Web –Structure of the Web –IR and web search – Static and DynamicRanking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR:Models and Languages – Indexing and Searching Parallel

and Distributed IR – DigitalLibraries.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Cambridge, Massachusetts London	Implementing and Evaluating Search Engines	The MIT Press	2010
2.	Ricardo Baeza–Yates, Berthier Ribeiro–Neto	Modern Information Retrieval: The concepts and Technology behind Search	ACM Press Books	2011

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stefan Buttcher,Charles L.A.Clarke, GordonV. Cormack	Information Retrieval	Elsevier	2010
2.	Manning ChristopherD., Raghavan Prabhakar& Schutze Hinrich	Introduction to Information Retrieval	University Press	2009

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23MCC14	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

Course Outcomes:

23MCC14.CO1 Explain influence of software architecture on business and technical activities

23MCC14.CO2 Summarize quality attribute workshop

23MCC14.CO3 Identify key architectural structures

23MCC14.CO4 Use styles and views to specify architecture

23MCC14.CO5 Design document for a given architecture

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC14.CO1	X	x	x	-	-	-	-	-		-	-	x	x	-	-
23MCC14.CO2	x	x	x	-	-	-	-		x	x	-	x	x	-	-
23MCC14.CO2	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC14.CO4	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC14.CO5	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-

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 views available 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 Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Len Bass, Paul Clements,andRick Kazman	Software Architectures Principles and Practices	Addison-Wesley	2003
2.	AnthonyJ Lattanze	Architecting Software Intensive System	Auerbach Publications	2010

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mark Hansen	SOA Using Java Web Services	Prentice Hal	2007
2.	David Garlan,Bradley Schmerl, and Shang- Wen Cheng,	Software Architecture Based Self- Adaptation	Springer Verlag	2009

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23MCC15	DIGITAL FORENSICS	L	T	P	C
		3	0	0	3

Course Objective:

- To learn the security issues network layer and transport layer.
- To be exposed to security issues of the application layer.
- To be familiar with forensics tools.
- To analyze and validate forensics data.
- To perform digital forensic analysis based on the investigator's position.

Course Outcomes:

23MCC15.CO1	Explain digital forensic process and role of forensic examiner.
23MCC15.CO2	Explore Legal amendments.
23MCC15.CO3	Demonstrate evidence collection
23MCC15.CO4	Explore computer forensics, network forensics and mobile device forensics.
23MCC15.CO5	Make Use forensics tools.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC15.CO1	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-
23MCC15.CO2	x	x	x	-	x	x	-	-	-	-	-	x	x	-	-
23MCC15.CO2	x	x	x	-	x	x	-	-	-	-	-	x	x	-	-
23MCC15.CO4	x	x	-	-	x	x	-	-	x	-	-	x	x	-	-
23MCC15.CO5	x	x	x	-	x	x	-	-	x	-	-	x	x	-	-

Unit-I INTRODUCTION 9

Digital Forensics – Uses- Digital Forensics Process – Locard's Exchange Principle – Scientific Method – Role of Forensic examiner in Judicial System – Key technical concepts – Bits, bytes and numbering schemes- File extension and file signatures – Storage and memory- computing environment.

Unit-II ANTI-FORENSICS & LEGAL 9

Introduction – Hiding data – Password attacks – Additional resources – Stegnography –Data destruction. Legal: Fourth Amendment – Criminal law-searches without a warrant –searching with a warrant- Electronic discovery-Expert testimony.

Unit-III EVIDENCE COLLECTION 9

Evidence Collection – Collection option – Obstacles – Types of Evidence – The rules of Evidence – General Procedure – Collection and archiving – Methods of collection – Artifacts – Collection steps – Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the digital Crime Scene – Computer Evidence processing steps - Legal Aspects of Collecting and Preserving Computer Forensic Evidence - Computer Image Verification and Authentication.

Unit-IV COMPUTER FORENSICS 9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud.Types of CF techniques – Incident and incident response methodology – Forensic duplication and investigation. Preparation for IR:Creating response tool kit and IR team. – Forensics Technology and Systems – Understanding Computer Investigation – Data Acquisition.

Unit-V NETWORK FORENSICS & MOBILE DEVICE FORENSICS 9

Introduction – Network fundamentals – Network Security tools – Network evidence and investigations. Mobile device forensics: Cellular Network – Cell phone evidence – Cell phone forensic tools- Global Positioning systems.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	John Sammons	The Basics of Digital Forensics The Primer for Getting Started in Digital Forensics	Syngress	2015
2.	CoryAltheide and Harlan Carvey	Digital Forensics with Open Source Tools	Elsevier publication	2011

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	NihadA. Hassan	Digital Forensics Basics: A Practical Guide Using Windows OS	A Press	2019
2.	DarrenR.Hayes	A Practical Guide to Digital Forensics Investigations	Pearson Education	2020

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23MCC16	DATA MINING AND DATA WAREHOUSING	L	T	P	C
		3	0	0	3

Course Objective:

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

Course Outcomes:

23MCC16.CO1	Identify data mining techniques in building intelligent model.
23MCC16.CO2	Illustrate association mining techniques on transactional databases.
23MCC16.CO3	Apply classification and clustering techniques in real world applications.
23MCC16.CO4	Evaluate various mining techniques on complex data objects.
23MCC16.CO5	Design, create and maintain data warehouses.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC16.CO1	x	x	x	-	-	-	-	-	-	-	-	x	x	-	-
23MCC16.CO2	x	x	x	-	-	x	-	x	-	x	-	x	x	-	-
23MCC16.CO2	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC16.CO4	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC16.CO5	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-

Unit-I DATA MINING & DATA PREPROCESSING **9**

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

Unit-II ASSOCIATION RULE **MINING AND CLASSIFICATION BASICS** **9**

Introduction to Association rules – Association Rule Mining – Mining Frequent Itemsets with and without Candidate Generation – Mining Various Kinds of Association Rules - Classification versus Prediction – Data Preparation for Classification and Prediction.

Unit-III CLASSIFICATION AND PREDICTION TECHNIQUES **9**

Classification by Decision Tree – Bayesian Classification – Rule Based Classification – Bayesian Belief Networks – Classification by Back Propagation – Support Vector Machines –K-Nearest Neighbor Algorithm –Linear Regression, Nonlinear Regression, Other Regression-Based Methods

Unit-IV CLUSTERING TECHNIQUES **9**

Cluster Analysis – Partitioning Methods: k-Means and k- Mediods – Hierarchical Methods: Agglomerative and Divisive – Density–Based Method: DBSCAN –Model Based Clustering Methods- Clustering High Dimensional Data - Outlier Analysis.

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 .

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jiawei Han &Micheline Kamber	Data Mining Concepts and Techniques	Morgan Kaufmann Publication	2010
2.	Alex Berson & StephenJ.Smith	Data Warehousing, DataMining & OLAP	TATA McGrawHill	2007

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Daniel T. Larose, Chantal D.Larose	Data mining and Predictive Analytics,	Wiley Publication	2015
2.	G.K.Gupta	Introduction to Data Mining with Case Studies	Prentice Hall of India	2014

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23MCC17	OPERATION RESEARCH	L	T	P	C
		3	0	0	3

Course Objective:

- To provide the concept and an understanding of basic concepts in Operations Research techniques for Analysis and Modeling in Computer Applications
- To understand , develop and solve mathematical model of linear programming problems
- To understand , develop and solve mathematical model of Transport and assignment problems
- To Understand network modeling for planning and scheduling the project activities

Course Outcomes:

23MCC17.CO1	Understand and apply linear programming to solve operational problem with constraints
23MCC17.CO2	Apply transportation and assignment models to find optimal solution
23MCC17.CO3	To prepare project scheduling using PERT and CPM
23MCC17.CO4	Identify and analyze appropriate queuing model to reduce the waiting time in queue.
23MCC17.CO5	To choose the best strategy using decision making methods under game theory

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC17.CO1	x	x	x	-	-	-	-	-	-	-	-	x	x	-	-
23MCC17.CO2	x	x	x	-	-	x	-	x	-	x	-	x	x	-	-
23MCC17.CO2	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC17.CO4	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC17.CO5	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-

Unit-I LINEAR PROGRAMMING MODELS 9

Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables: big-M method, degeneracy and unbound solutions.

Unit-II TRANSPORTATION AND ASSIGNMENT MODELS 9

Formulation - Methods for finding basic Feasible Solution - Optimality Test - MODI method - Degeneracy in Transportation Problem -Unbalanced Transportation Problem. Assignment Method: Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem

Unit-III SCHEDULING BY PERT AND CPM 9

Introduction - Rules to frame a Network - Fulkerson's Rule to numbering of events - Activity, Times - Critical Path Computation - Slack and Float - PERT- Steps and computing variance, Merits and demerits of PERT, CPM-Time estimating & Limitations, Comparison between PERT & CPM.

Unit-IV QUEUEING MODELS 9

Characteristics of Queueing Models–Poisson Queues-(M /M/1):(FIFO/∞/∞), (M / M / 1) :(FIFO / N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞)models.

Unit-V GAME THEORY 9

Competitive game, rectangular game, saddle point, minimax (maximin) method of optimal strategies- value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Taha H.A	Operations Research: An Introduction	10th Edition, Prentice Hall of India, New Delhi	2017
2.	Ronald L Rardin	OptimizationIn Operations Research	2ndEdition Pearson Education, India	2018
3.	atinder Kumar	Optimization Techniques in Operations Research	LAP LAMBERT Academic Publishing	2015

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kanti Swarup, P.K. Gupta, Man Mohan	Operations Research	15th Revised Edition, S.Chand&Sons Education Publications,New Delhi	2017
2.	D.S.Hira and P.K.Gupta	Operations Research	5th Edition, S.Chand& Sons	2015

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23MCC18	PROFESSIONAL ETHICS IN IT	L	T	P	C
		3	0	0	3

Course Objective:

- To understand the concepts of computer ethics in 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

Course Outcomes:

23MCC18.CO1	Helps to examine situations and to internalize the need for applying ethical principles, values to tackle with various situations.
23MCC18.CO2	Develop a responsible attitude towards the use of computer as well as the technology.
23MCC18.CO3	Able to envision the societal impact on the products/ projects they develop in their career
23MCC18.CO4	Understanding the code of ethics and standards of computer professionals.
23MCC18.CO5	Analyze the professional responsibility and empowering access to information in the work place.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC18.CO1	x	x	x	-	-	-	-	-	-	-	-	x	x	-	-
23MCC18.CO2	x	x	x	-	-	-	-	-	x	x	-	x	x	-	-
23MCC18.CO2	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC18.CO4	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC18.CO5	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-

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 RevetonRansomware Attacks -IT Security Incidents: A Major Concern - Why Computer Incidents Are So Prevalent -Types of Exploits -Types of Perpetrators-Federal Laws for Prosecuting Computer Attacks-Implementing Trustworthy Computing -Risk Assessment Establishing a Security Policy - Educating Employees and Contract Work

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 Issues- Data 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 Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Caroline Whitback	Ethics in Engineering Practice and Research	Cambridge University Press	2011
2.	George Reynolds	Ethics in Information Technology	Cengage Learning	2018

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Penny Duquenoy, Simon-Jones and Barry G Blundell	Ethical, legal and professional issues in computing	Middle sex University Press	2008
2.	Sara Baase	A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Interne	Prentice Hall	2009

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23MCC19	MARKETING MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objective:

- To provide basic knowledge of concepts, principles, tools and techniques of Marketing.
- To provide an exposure to the students pertaining to marketing strategies, which they are expected to possess when they enter the industry as practitioners.
- To give them an understanding of the various marketing Strategies used in consumer and industrial marketing.

Course Outcomes:

23MCC19.CO1	Knowledge of basic understanding in solving marketing related problems.
23MCC19.CO2	Awareness of marketing management process, strategies and the marketing mix elements.
23MCC19.CO3	Clear understanding of functional area of marketing
23MCC19.CO4	Demonstrating conceptual knowledge and analytical skills in analyzing the marketing environment.
23MCC19.CO5	Develop skills in recent trends in global marketing.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC19.CO1	X	x	x	-	-	-	-	x	-	x	-	x	x	-	-
23MCC19.CO2	X	x	x	-	-	X	x	x	x	x	-	x	x	-	-
23MCC19.CO2	X	x	x	-	-	X	x	x	x	x	-	x	x	-	-
23MCC19.CO4	X	x	x	-	-	X	-	x	x	x	-	x	x	-	-
23MCC19.CO5	X	x	x	-	-	x	-	x	x	x	-	x	x	-	-

Unit-I INTRODUCTION TO MARKETING MANAGEMENT 9

Introduction - Market and Marketing - the Exchange Process- Core Concepts of Marketing - Functions of Marketing- Importance of Marketing - Marketing Orientations -Marketing Mix The Traditional 4Ps - The Modern Components of the Mix - The Additional 3Ps - Developing an Effective Marketing Mix.

Unit-II MARKETING ENVIRONMENT 9

Introduction - Environmental Scanning - Analysing the Organization's Micro Environment - Company's Macro Environment, Differences between Micro and Macro Environment - Techniques of Environment Scanning - Marketing organization - Marketing Research and the Marketing Information System, Types and Components.

Unit-III CONSUMER AND BUSINESS BUYER BEHAVIOUR 9

Introduction - Characteristics - Types of Buying Decision Behaviour - Consumer Buying Decision Process - Buying Motives - Buyer Behaviour Models - Characteristics of Business Markets - Differences between Consumer and Business Buyer Behaviour - Buying Situations in Industrial/Business Market - Buying Roles in Industrial Marketing - Factors that Influence Business Buyers - Steps in Business Buying Process

Unit-IV SEGMENTATION, TARGETING AND POSITIONING 9

Introduction - Concept of Market Segmentation - Benefits of Market Segmentation - Requisites of Effective Market Segmentation - The Process of Market Segmentation - Bases for Segmenting Consumer Markets - Targeting (T) - Market Positioning (P)

Unit-V INTERNATIONAL MARKETING MANAGEMENT & RECENT TRENDS 9

Introduction - Nature of International Marketing - International Marketing Concept – International Market Entry Strategies - Approaches to International Marketing - Cause related marketing - Ethics in marketing –Online marketing trends

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Sherlekar	Marketing Management	S.A, Himalaya Publishing House, Thirteenth Edition	2016
2.	Philip Kotler and Kevin Lane Keller	Marketing Management	PHI 15th Edition	2015
3.	S.H.H.Kazmi	Marketing Management	Excel Books India, 2nd Edition	2013

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	C.BGupta& N.Rajan Nair	Marketing Management text and Case	17thEdition	2016
2.	VSRamaswamy& S Namkumari	Marketing management Global Perspective, Indian Context	Macmillan Publishers India, 5th Edition	2015

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23MCC20	ORGANIZATIONAL BEHAVIOR	L	T	P	C
		3	0	0	3

Course Objective:

- The objective is to enable the students to understand the Organizational Behavior, and Organizational Change and dynamic of groups.
- To understand the human interactions in an organization

Course Outcomes:

23MCC20.CO1	Students will have a better understanding of human behavior in organization.
23MCC20.CO2	They will know the framework for managing individual and group performance.
23MCC20.CO3	Characteristics of attitudes and components of attitudes — A brief discussion
23MCC20.CO4	List the determinants of personality
23MCC20.CO5	List the characteristics of various leadership styles.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC20.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCC20.CO2	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
23MCC20.CO2	x	x	x	-	-	x	x	X	x	x	-	x	x	-	-
23MCC20.CO4	x	x	x	-	-	x	-	X	x	x	-	x	x	-	-
23MCC20.CO5	x	x	x	-	-	x	-	X	x	x	-	x	x	-	-

Unit-I ORGANISATIONAL BEHAVIOUR 9

Organization Behaviour – Definition – Scope and Application in Management – Contributions of Other Disciplines to OB. Emerging Issues in Organizational Behaviour- Organizational behaviour models

Unit-II INDIVIDUAL PROCESSES 9

Personality – types – Factors influencing personality– Theories. Emotions - Theories – Emotional Intelligence- Learning – Types of learners – The learning process – Learning theories. Perceptions – Importance – Factors influencing perception- Attitudes – Nature of Attitudes Components of Attitudes Formation of Attitude Benefits of Positive Attitude Functions of Attitudes– Measurement-Motivation – Importance – Types – Theories.

Unit-III LEADERSHIP AND POWER 9

Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

Unit-IV GROUP DYNAMICS 9

Meaning – Types of Groups – Functions of Small Groups – Group Size Status – Managerial Implications – Group Behaviour – Group Norms – Cohesiveness – Group Thinking

Unit-V ORGANISATIONAL CHANGE AND DEVELOPMENT 9

Organizational Change: Meaning – Nature of Work Change – Need for Change – Change Process – Types of Change – Factors Influencing Change – Resistance to Change – Overcoming Resistance – Organizational Development: Meaning and Different Types of OD Interventions.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	K.Aswathappa	Organizational behavior	Himalaya Publishing House Pvt. Ltd	2012
2.	Stephen P.Robins	Organizational behavior	PHI Learning/Pearson Education, Edition 17	2013
3.	Fred Luthans	Organizational behavior	McGrawHill,12th Edition	2016

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Nelson,Quick, Khandelwal	ORGB–An innovative approach to learning and teaching	Cengage,2nd edition	2012
2.	Robert Kreitner and Angelo Kinicki	Organizational behavior	Tata McGrawHill, 10th Edition	2016

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23MCC21	SOFTWARE TESTING AND QUALITY ASSURANCE	L	T	P	C
		3	0	0	3

Course Objective:

- To know the behavior of the testing techniques and to design test cases to detect the errors in the software
- To get insight into the levels of testing in the user environment
- To understand standard principles to check the occurrence of defects and its removal
- To learn the functionality of automated testing tools to apply in the specialized environment
- To understand the models and metrics of software quality and reliability

Course Outcomes:

23MCC21.CO1 Able to test the software by applying various testing techniques.

23MCC21.CO2 Able to debug the project and to test the entire computer based systems at all levels.

23MCC21.CO3 Able to test the applications in the specialized environment using various automation tools.

23MCC21.CO4 Able to evaluate the web applications using bug tracking tools.

23MCC21.CO5 Able to apply quality and reliability metrics to ensure the performance of the software.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC21.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCC21.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC21.CO2	x	x	x	x	x	x	x	-	x	x	x	x	x	-	-
23MCC21.CO4	x	x	x	x	x	x	x	-	x	x	x	x	x	-	-
23MCC21.CO5	x	x	x	-	x	x	x	-	x	x	x	x	x	-	-

Unit-I TESTING TECHNIQUES & TEST CASE DESIGN 9

Using White Box Approach to Test design - Test Adequacy Criteria – Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Their Role in White box Based Test Design – Code Complexity Testing – Evaluating Test Adequacy Criteria. Test Case Design Strategies – Using Black Box Approach to Test Case Design – Random Testing – Requirements based testing – Boundary Value Analysis –Decision tables – Equivalence Class Partitioning – State-based testing – Cause-effect graphing – Error guessing – Compatibility testing – User documentation testing – Domain testing – Case study for Control Flow Graph and State-based Testing.

Unit-II LEVELS OF TESTING 9

The Need for Levels of Testing- UNIT Test Planning –Designing the UNIT Tests – The Test Harness – Running the UNIT tests and Recording Results – Integration Tests – Designing Integration Tests – Integration Test Planning – Scenario Testing – Defect Bash Elimination. System Testing – Acceptance testing – Performance testing – Regression Testing - Internationalization testing - Ad-hoc testing – Alpha, Beta Tests- Testing OO systems – Usability and Accessibility Testing – Configuration Testing - Compatibility Testing – Testing the documentation – Website Testing - Case Study for UNIT and Integration Testing.

Unit-III TESTING FOR SPECIALIZED ENVIRONMENT 9

Testing Client / Server Systems – Testing in a Multiplatform Environment - Testing Object-Oriented Software – Object Oriented Testing – Testing Web based systems – Web based system – Web Technology Evolution – Traditional Software and Web based Software – Challenges in Testing for Web-based Software – Quality Aspects – Web Engineering – Testing of Web based Systems. Case Study for Web Application Testing

Unit-IV TEST AUTOMATION 9

Selecting and Installing Software Testing Tools - Software Test Automation – Skills needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Tracking the Bug – Debugging – Case study using Bug Tracking Tool.

Unit-V SOFTWARE TESTING AND QUALITY METRICS 9

Six-Sigma – TQM - Complexity Metrics and Models – Quality Management Metrics - Availability Metrics - Defect Removal Effectiveness - FMEA - Quality Function Deployment – Taguchi Quality Loss Function – Cost of Quality.Case Study for Complexity and Object Oriented Metrics.

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	AdithyaP.Mathur	Foundations of Software Testing–Fundamentals algorithms and Techniques	Dorling Kindersley (India) Pvt. Ltd	2008
2.	BorisBeizer	Software Testing Techniques	Dream Tech Press	2009
3.	DaleH.Besterfiled	Total Quality Management	Pearson Education Asia, Third Edition	2011

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	GlenfordJ.Myers, TomBadgett,Corey Sandler	The Art of Software Testing	3rd Edition,JohnWiley& Sons Publication	2012
2.	NareshChauhan	Software Testing Principles and Practices	Oxford University Press	2010

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23MCC22	ADVANCES IN NETWORKING	L	T	P	C
		3	0	0	3

Course Objective:

- To understand the theme underlying IPv6 Structure and addressing methods
- To understand and analyse the protocols for IPv6 Implementation
- To identify and provide solutions for QoS and Security Issues with IPv6
- To learn about Software Defined concepts, architectures, protocols and applications
- To explore the significance of Network Function Virtualization

Course Outcomes:

23MCC22.CO1	Understand the fundamentals of IPv6 and IPv6 Protocols
23MCC22.CO2	Analyze the need for separation of data and control plane
23MCC22.CO3	Understand the functionality of NFV
23MCC22.CO4	Be Conversant with the latest networks and its architecture
23MCC22.CO5	Gain an in-depth coverage of various networking technologies

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC22.CO1	x	x	x	-	-	-	-	-	x	-	-	x	x	-	-
23MCC22.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC22.CO2	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC22.CO4	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-
23MCC22.CO5	x	x	x	-	-	x	-	x	x	x	-	x	x	-	-

Unit-I IPv6 STRUCTURE AND ADDRESSING 9

IPv4 Address Depletion- IPv6 Transition Issues-IPv6 Structure: IPv6 Header, Extension Headers: Hop-by-Hop Options Header, Destination Options Header, Routing Header, Fragment Header, AH, ESP- IPv6 Addresses: Unicast, Anycast, Multicast – Address Autoconfiguration

Unit-II IPv6 NETWORKING 9

IPv6 Internet Control Message Protocol (ICMPv6): ICMPv6 Messages, ragmentation and Path MTU- IPv6 Neighbor Discovery- IPv6 Routing: RIPng, EIGRP for IPv6, Fv3 - Mobile IPv6 .

Unit-III QoS, PROVISIONING AND SECURITY WITH IPv6 **9**

QoS in IPv6 Protocols: Differentiated Services and IPv6, IPv6 Flows, Explicit Congestion Notification in IPv6 – Provisioning: Stateless DHCPv6,Stateful DHCPv6, DNS Extensions for IPv6- Security with IPv6: IP Security Protocol (IPsec)Basics, IPv6 Security Elements, Interaction of IPsec with IPv6 Elements

Unit-IV SOFTWARE DEFINED NETWORKING 9

Genesis of SDN – Separation of Control Plane and Data Plane – Distributed Control Plane – IP and MPLS – Characteristics of SDN – Operation – Devices – Controller – OpenFlow Specification

Unit-V NETWORK FUNCTION VIRTUALIZATION 9

Building SDN Framework – Network Functions Virtualization – Introduction –Virtualization and Data Plane I/O – Service Locations and Chaining – Applications – Use Cases of SDNs: Data Centers, Overlays, Big Data and Network Function Virtualization

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rick Grazian	IPv6 Fundamentals: A Straight forward Approach to Understanding IPv6	Cisco Press	2017
2.	Peter Loshin	IPv6:Theory, Protocol and Practice	Morgan Kaufmann Publishers	2004

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Foundations of Modern Networking – SDN, NFC, QoE, IoT and Cloud	Pearson Education	2019
2.	Oswald Coker, Siamak Azodolmolky	Software-Defined Networking with Open Flow	Packet Publishing	2017

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23MCC23	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.
- 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.

Course Outcomes:

23MCC23.CO1	Identify and describe soft computing techniques and their roles in building intelligent machines.
23MCC23.CO2	Recognize the feasibility of applying a soft computing methodology for a particular problem.
23MCC23.CO3	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
23MCC23.CO4	Apply genetic algorithms to optimization problems.
23MCC23.CO5	Design neural networks to pattern classification and regression problems using soft computing approach.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC23.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCC23.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC23.CO2	x	x	x	-	x	x	-	-	-	x	-	x	x	-	-
23MCC23.CO4	x	x	x	-	x	x	-	-	x	x	-	x	x	-	-
23MCC23.CO5	x	x	x	-	x	x	-	-	-	x	-	x	x	-	-

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, Fuzzifications and Defuzzificataions, 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 Multi layer Feed Forward Networks, Recurrent Networks. Various Learning Techniques; Perception and Convergence Rule, Auto, Associative and Hetero-Associative Memory.

Unit-III BACKPROPAGATION NETWORKS 9

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

Unit-IV COMPETETIVE 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 Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S.Rajasekaranand G.A.VijayalakshmiPai	Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications	Prentice Hall of India	2003
2.	J.S.R.Jang,C.T. SunandE. Mizutani	Neuro–Fuzzy and Soft Computing	Pearson Education	2004
3.	S.N.Sivanandam, S.N.Deepa	Principles of Soft Computing	Second Edition,Wileyn	2007

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Timothy Ross	Fuzzy Logic with Engineering Applications	Wiley Publications, 4th Edition	2016
2.	David E.Goldberg	Genetic Algorithms in Search, Optimization and Machine Learning	Pearson Education, First Edition	2008

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23MCC24	DEEP LEARNING	L	T	P	C
		3	0	0	3

Course Objective:

- To understand how to represent the high-dimensional data, such as images, text and data.
- To explain convolution neural network
- To introduce major deep learning algorithms and their applications to solve real world problems.
- To explore about optimization and generalization in Deep learning
- To understand about deep reinforcement learning

Course Outcomes:

23MCC24.CO1	Describe the fundamental concepts of Neural Networks
23MCC24.CO2	Apply Convolution Neural Network techniques to solve problems in image processing
23MCC24.CO3	Summarize the characteristics of deep Learning
23MCC24.CO4	Comprehend the Optimization and Generalization in Deep Learning
23MCC24.CO5	Interpret the concepts of Deep Reinforcement Learning to solve real world problems.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC24.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCC24.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC24.CO2	x	x	x	-	x	-	-	-	x	x	-	x	x	-	-
23MCC24.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC24.CO5	x	x	x	-	x	-	-	-	x	x	-	x	x	-	-

Unit-I NEURAL NETWORK 9

Building Intelligence Machine-Expressing Linear Perceptron as Neurons-Feed Forward Neural Netwoks - Activation function. Supervised and Unsupervised Learning:Single Layer Perceptron – Perceptron Learning Algorithm – Least Mean Square Learning Algorithm - Multilayer Perceptron – Back Propagation Algorithm – XOR problem – Limitations of Back Propagation Algorithm- Implementing Neural Networks in TensorFlow.

Unit-II CONVOLUTION NEURAL NETWORK 9

Introduction-Filter and Feature Maps-Full Description of CNN-Max Pooling- Full Architectural Description of CNN-Image Preprocessing Pipeline Enable More RoburstModels,Accelerating Training with Batch Normalization- Visualizing Learning with Convolution Network-Leveraging and Learning Convolution Filters - Predefined Convolutional Filters Network (PCFNet)- Transfer Learning with Convolutional Neural Networks.

Unit-III DEEP NETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks - Convolutional Networks- Generative Adversarial Networks (GAN), Semisupervised Learning

Unit-IV OPTIMIZATION AND GENERALIZATION 9

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning.

Unit-V DEEP REINFORCEMENT LEARNING 9

Markov Decision Processes-Explore versus Exploit-Policy versus Value Learning-Pole-Cart with Policy Gradients- Q Learning and Deep Q Networks-Improving and Moving Beyond DQN

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Nikhil Buduma, NicholasLocascio,.	Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms	First Edition,O'Reilly Media	2017
2.	Sudharsan Ravichandiran	Hands on Deep Learning Algorithms with Python	First Edition, Packt Publishing Limited	2019
3.	Nikhil Buduma, NicholasLocascio,.	Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms	First Edition,O'Reilly Media	2017

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	François Chollet	Deep Learning with Python	First Edition,Manning Publications Company	2017
2.	Ian Goodfellow, Yoshua Bengio and Aaron Courville	Deep Learning	First edition, MIT Press, London	2016

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23MCC25	BIG DATA PROCESSING	L	T	P	C
		3	0	0	3

Course Objective:

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

Course Outcomes:

23MCC25.CO1	Work with big data tools and its analysis techniques
23MCC25.CO2	Analyze data by utilizing clustering and classification algorithms
23MCC25.CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data
23MCC25.CO4	Perform analytics on data streams
23MCC25.CO5	Learn NoSQL databases and management.

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC25.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
23MCC25.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC25.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC25.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
23MCC25.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

Unit-I INTRODUCTION TO BIG DATA **9**

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

Unit-II CLUSTERING AND CLASSIFICATION **9**

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

Unit-III ASSOCIATION AND RECOMMENDATION SYSTEM **9**

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

Unit-IV STREAM MEMORY **9**

Introduction to Streams Concepts – Stream Data Model and Architecture – Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform (RTAP) applications – Case Studies – Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

Unit-V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION **9**

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

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	EMC Education Services	Data Science and Big Data Analytics: Discovering, Analyzing,Visualizing and PresentingData	Wiley publishers	2015
2.	Jure Leskovec Anand Rajaraman and Jeffrey David Ullman	Mining of Massive Datasets	Cambridge University Press	2016
3.	David Loshin	Big Data Analytics:From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph	Morgan Kaufmann/ Elsevier Publishers	2013

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kim H.Pries and Robert Dunnigan	Big Data Analytics:A Practical Guide for Managers	CRC Press	2015
2.	Bart Baesens	Analytics in a Big Data World:The Essential Guide to Data Science and its Applications	Wiley Publishers	2014

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23MCC26	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

Course Objective:

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

Course Outcomes:

23MCC26.CO1	Explain autonomous agents that make effective decisions in fully informed, partially observable, and adversarial settings
23MCC26.CO2	Choose appropriate algorithms for solving given AI problems
23MCC26.CO3	Implement a design in terms of Gamming
23MCC26.CO4	Design and implement logical reasoning agents
23MCC26.CO5	Design and implement agents that can reason under uncertainty

Course Outcomes	Program Outcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCC26.CO1	X	-	-	-	X	-	-	X	-	-	-	-	-	-	X
23MCC26.CO2	x	-	-	x	x	X	-	-	-	-	x	-	-	x	-
23MCC26.CO2	-	x	x	-	x	-	x	-	-	-	-	-	-	x	-
23MCC26.CO4	-	-	x	x	x	-	x	-	-	-	-	-	x	-	-
23MCC26.CO5	-	-	x	-	x	-	x	-	-	-	x	-	-	x	-

Unit-I INTELLIGENT AGENTS 9

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

Unit-II PROBLEM SOLVING 9

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

Unit-III GAME PLAYING AND CSP 9

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

Unit-IV LOGICAL AGENTS 9

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

Unit-V KNOWLEDGE REPRESENTATION AND PLANNING 9

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

Total Periods: 45

Text Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stuart Russel and peter Novig	Artifical Intelligence:A Modern Approach	Fourth Edition,Perason Eduation	2020

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dan W.Patterson	Introduction to AI and Es	Perason Eduction	2007
2.	Deepak Khemani	Artifical Intelligence	Tata MCGraw Hill Education	2013

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23MCD01	PROJECT WORK	L	T	P	C
		0	0	24	12

Course Objective:

- To develop knowledge to formulate a real-world problem and project's goals.
- To identify the various tasks of the project to determine standard procedures.
- To identify and learn new tools, algorithms and techniques.
- To understand the various procedures for validation of the product and analysis the cost effectiveness.
- To understand the guideline to prepare report for oral demonstrations

Course Outcomes:

23MCD01.CO1	Formulate a real-world problem, identify the requirement and develop the design solutions.
23MCD01.CO2	Express the technical ideas, strategies and methodologies.
23MCD01.CO3	Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
23MCD01.CO4	Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
23MCD01.CO5	Prepare report and present the oral demonstrations.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MCD01.CO1	x	x	-	X	-	X	-	x	x	-	x	x	x	x	-
23MCD01.CO2	x	x	x	X	-	-	-	-	x	-	x	x	x	x	-
23MCD01.CO2	x	x	x	X	x	X	-	-	x	-	x	x	x	x	x
23MCD01.CO4	x	x	x	X	x	X	-	-	x	-	x	x	x	x	x
23MCD01.CO5	-	-	-	-	-	-	-	-	x	x	x	x	-	-	-

TOTAL: 360 Periods

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