MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

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

Estd. 2000

Curriculum/Syllabus

Programme Code : **MC**

Programme Name : **Master of Computer Applications**

Regulation : **R - 2021**

MUTHAYAMMAL ENGINEERING COLLEGE

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

Rasipuram - 637 408, Namakkal Dt, Tamil Nadu.

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

INSTUTION VISION & MISSION

INSTUTION VISION

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

INSTUTION 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

INSTUTION MOTTO

Rural upliftment through Technical Education.

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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.

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DEPARTMENT PROGRAM EDUCATIONAL OBJECTIVES, PROGRAM OUTCOMES& PROGRAM SPECIFIC OUTCOMES

PROGRAM EDUCATIONAL OBJECTIVES

The Master of Computer Applications Graduates should be able to

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

PEO2: Analytical Skill: Graduates should be able to employ technical skills to solve societal and environmental issues in an ethical manner.

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

PROGRAM OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES

PSO1: Professional Skill Development: Graduates should be able to exercise technical expertise, excel in communication skills and leadership to manage diverse audience in their career.

PSO2: Analytical Skill and Problem-Solving Expertise: Graduates should be able to employ technical skills to solve societal and environmental issues in an ethical manner.

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

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MASTER OF COMPUTER APPLICATIONS

GROUPING OF COURSES

FOUNDATION COURSE [FC]

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	21MCA01	Mathematical Foundations of Computer Science	FC	4	3	1	0	4

PROFESSIONAL CORE [PC]

S.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	21MCB01	Computer Organizations and Architecture	PC	3	3	0	0	3
2.	21MCB02	Data Structures and Algorithms	PC	3	3	0	0	3
3.	21MCB03	Relational Data Base Management Systems	PC	3	3	0	0	3
4.	21MCB04	Problem Solving and Python Programming	PC	3	3	0	0	3
5.	21MCB05	Operating Systems	PC	3	3	0	0	3
6.	21MCB06	Data Structures and Algorithms Laboratory	PC	4	0	0	4	2
7.	21MCB07	Relational Data Base Management Systems Laboratory	PC	4	0	0	4	2
8.	21MCB08	Python Programming Laboratory	PC	4	0	0	4	2
9.	21MCB09	Data Communication and Networks	PC	3	3	0	0	3
10.	21MCB10	Software Engineering	PC	3	3	0	0	3
11.	21MCB11	Internet and Java Programming	PC	3	3	0	0	3
12.	21MCB12	Object Oriented Analysis and Design	PC	3	3	0	0	3
13.	21MCB13	Big Data Analytics	PC	3	3	0	0	3

14.	21MCB14	Internet Programming Laboratory	PC	4	0	0	4	2
15.	21MCB15	Software Development Laboratory – Case Tools Lab	PC	4	0	0	4	2
16.	21MCB16	Data Analytics Laboratory	PC	4	0	0	4	2
17.	21MCB17	Mobile Computing	PC	3	3	0	0	3
18.	21MCB18	Network Programming	PC	3	3	0	0	3
19.	21MCB19	Mobile App Development Laboratory	PC	4	0	0	4	2
20.	21MCB20	Network Programming Laboratory	PC	4	0	0	4	2

PROFESSIONAL ELECTIVES [PE]

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	21MCC01	Software Project Management	PE	3	3	0	0	3
2.	21MCC02	Web Technologies	PE	3	3	0	0	3
3.	21MCC03	E Learning	PE	3	3	0	0	3
4.	21MCC04	Software Quality and Testing	PE	3	3	0	0	3
5.	21MCC05	Advances in Operating Systems	PE	3	3	0	0	3
6.	21MCC06	Cyber Security	PE	3	3	0	0	3
7.	21MCC07	C# and .Net Programming	PE	3	3	0	0	3
8.	21MCC08	Wireless Networking	PE	3	3	0	0	3
9.	21MCC09	Web Design	PE	3	3	0	0	3
10.	21MCC10	Network Programming and Security	PE	3	3	0	0	3
11.	21MCC11	Cloud Computing Technologies	PE	3	3	0	0	3
12.	21MC C12	Bio Inspired Computing	PE	3	3	0	0	3
13.	21MCC13	Information Retrieval Techniques	PE	3	3	0	0	3
14.	21MCC14	Software Architecture	PE	3	3	0	0	3
15.	21MCC15	Digital Forensics	PE	3	3	0	0	3
16.	21MCC16	Data Mining and Data Warehousing	PE	3	3	0	0	3
17.	21MCC17	Operations Research	PE	3	3	0	0	3
18.	21MCC18	Professional Ethics in IT	PE	3	3	0	0	3

19.	21MCC19	Marketing Management	PE	3	3	0	0	3
20.	21MCC20	Organizational Behavior	PE	3	3	0	0	3
21.	21MCC21	Software Testing and Quality Assurance	PE	3	3	0	0	3
22.	21MCC22	Advances in Networking	PE	3	3	0	0	3
23.	21MCC23	Soft Computing Techniques	PE	3	3	0	0	3
24.	21MCC24	Deep Learning	PE	3	3	0	0	3
25.	21MCC25	Big Data Processing	PE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	21MCD01	Project Work	EEC	24	0	0	24	12

COURSE COMPONENT SUMMARY

S. No.	Subject Area	Credits Per Semester				Credits Total	AICTE Credits
		I	II	III	IV		
1	FC	4	-	-	-	4	4
2	PC	21	21	10	-	52	52
3	PE	0	3	12	-	15	15
4	EEC	0	0	0	12	12	12
TOTAL		25	24	22	12	**83**	**83**

Total Credits: 83

	MUTHAYAMMAL ENGINEERING COLLEGE (Autonomous) (Approved by AICTE & Affiliated to Anna University), RASIPURAM – 637 408	CURRICULUM PG R – 2021
Department	Master of Computer Applications	
Programme	M.C.A	

		SEMESTER – I					

Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	21MCA01	Mathematical Foundations of Computer Science	3	1	0	4	4
2.	21MCB01	Computer Organization and Architecture	3	0	0	3	3
3.	21MCB02	Data Structures and Algorithms	3	0	0	3	3
4.	21MCB03	Relational Data Base Management Systems	3	0	0	3	3
5.	21MCB04	Problem Solving and Python Programming	3	0	0	3	3
6.	21MCB05	Operating Systems	3	0	0	3	3
PRACTICALS							
7.	21MCB06	Data Structures and Algorithms Laboratory	0	0	4	2	4
8.	21MCB07	Relational Data Base Management Systems Laboratory	0	0	4	2	4
9.	21MCB08	Python Programming Laboratory	0	0	4	2	4
		Total Credits				**25**	

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Department	Master of Computer Applications	
Programme	M.C.A	

SEMESTER – II

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	21MCB09	Data Communication and Networks	3	0	0	3	3
2.	21MCB10	Software Engineering	3	0	0	3	3
3.	21MCB11	Internet and Java Programming	3	0	0	3	3
4.	21MCB12	Object Oriented Analysis and Design	3	0	0	3	3
5.	21MCB13	Big Data Analytics	3	0	0	3	3
6.		**Elective I**	3	0	0	3	3
PRACTICALS							
7.	21MCB14	Internet Programming Laboratory	0	0	4	2	4
8.	21MCB15	Software Development- CASE Tools Laboratory	0	0	4	2	4
9.	21MCB16	Data Analytics Laboratory	0	0	4	2	4
		Total Credits				**24**	

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Programme	M.C.A	

		SEMESTER – III					
Sl. No.	**Course Code**	**Course Name**	**Hours/ Week**			**Credit**	**Contact Hours**
			L	**T**	**P**	**C**	
		THEORY					
1.	21MCB17	Mobile Computing	3	0	0	3	3
2.	21MCB18	Network Programming	3	0	0	3	3
3.		**Elective II**	3	0	0	3	3
4.		**Elective III**	3	0	0	3	3
5.		**Elective IV**	3	0	0	3	3
6.		**Elective V**	3	0	0	3	3
PRACTICALS							
7.	21MCB19	Mobile App Development Lab	0	0	4	2	4
8.	21MCB20	Network Programming Lab	0	0	4	2	4
		Total Credits				**22**	

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Department	Master of Computer Applications	
Programme	M.C.A	

SEMESTER – IV

Sl. No.	Course Code	Course Name	Hours/week			Credit	Contact Hours
			L	T	P	C	
PRACTICAL							
1	21MCD01	Project Work	0	0	24	12	24
		Total Credits				**12**	

21MCA01	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- Able to design digital circuits by simplifying the Boolean functions
- Able to Understand the organization and working principle of computer hardware components
- Able to understand mapping between virtual and physical memory
- Acquire knowledge about multiprocessor organization and parallel processing
- Able to trace the execution sequence of an instruction through the processor

COURSE OUTCOMES:

21MCA01.CO1	:	Apply Mathematical Logic to validate logical arguments and programmes.
21MCA01.CO2	:	Apply combinatorial counting principles to solve application problems.
21MCA01.CO3	:	Apply graph model and graph techniques for solving network other connectivity related
21MCA01.CO4	:	Apply algebraic ideas in developing cryptograph techniques for solving network security
21MCA01.CO5	:	Apply Boolean laws in developing and simplifying logical circuits.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCA01.CO1	X	X	-	-	-	-	-	-	-	-	-	X	-	X	-
21MCA01.CO2	X	X	X	-	-	-	-	-	-	-	-	X	-	X	-
21MCA01.CO3	X	X	X	-	-	-	-	-	-	-	-	X	-	X	-
21MCA01.CO4	X	X	X	-	-	-	-	-	-	-	-	X	-	X	-
21MCA01.CO5	X	X	-	-	-	-	-	-	-	-	-	X	-	X	-

UNIT I   LOGIC AND PROOFS   9

Propositional Logic – Propositional Equivalences – Predicates and Quantifiers – Nested Quantifiers – Rules of Inference – Introduction to Proofs – Proof Methods and Strategy.

UNIT II   COMBINATORICS   9

Mathematical Induction – Strong Induction and Well Ordering – The Basics of Counting - The Pigeonhole Principle – Permutations and Combinations – Recurrence Relations Solving Linear Recurrence Relations Using Generating Functions – Inclusion – Exclusion – Principle and Its Applications.

UNIT III   GRAPHS   9

Graphs and Graph Models – Graph Terminology and Special Types of Graphs – Matrix Representation of Graphs and Graph Isomorphism – Connectivity – Euler and Hamilton Paths.

UNIT IV   ALGEBRAIC STRUCTURES   9

Groups – Subgroups – Homomorphisms – Normal Subgroup and Coset – Lagrange's Theorem – Definitions and Examples of Rings and Fields.

UNIT V   LATTICES AND BOOLEAN ALGEBRA   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: 45 Periods

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, 30th Reprint, New Delhi	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, 3rd Edition, New Delhi	2014
2.	ThomasKoshy	Discrete Mathematics with Applications	2nd Edition, Elsevier Publications, Boston	2006
3.	SeymourLipschutz and Mark Lipson	Discrete Mathematics	Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., Third Edition, New Delhi	2013

WEB URLs:

1. www.youtube.com/watch?v=AgSuEuOnoWM
2. www.youtube.com/watch?v=LZQbPIwzAA4
3. www.youtube.com/watch?v=HkNdNpKUByM
4. www.youtube.com/watch?v=vfyUU_prh9s
5. www.youtube.com/watch?v=SIzSSIdVyEI

21MCB01	COMPUTER ORGANIZATION AND ARCHITECTURE	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- 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:

21MCB01.CO1	:	Able to design digital circuits by simplifying the Boolean functions
21MCB01.CO2	:	Able to Understand the organization and working principle of computer hardware
21MCB01.CO3	:	Able to understand mapping between virtual and physical memory
21MCB01.CO4	:	Acquire knowledge about multiprocessor organization and parallel processing
21MCB01.CO5	:	Able to trace the execution sequence of an instruction through the processor

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB01.CO1	X	X	X	-	X	-	-	-	-	-	-	X	X	-	-
21MCB01.CO2	X	X	X	X	-	-	-	-	-	X	X	X	X	X	-
21MCB01.CO3	X	X	X	-	X	X	-	-	X	X	-	-	X	-	-
21MCB01.CO4	X	X	X	X	-	-	-	-	X	-	-	X	X	X	-
21MCB01.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, Logic Gates – NAND – NOR Implementation.

UNIT II   COMBINATIONAL AND SEQUENTIAL CIRCUITS   9

Design of Combinational Circuits – Adder - Subtractor – Encoder – Decoder – MUX - DEMUX – Comparators, Flip Flops – Triggering – Master – Slave Flip Flop – State Diagram and Minimization – Counters – Registers.

UNIT III   BASIC STRUCTURE OF COMPUTERS   9

Functional units – Basic operational concepts – Bus structures – Performance and Metrics – Instruction and Instruction sequencing – Addressing modes – ALU Design – Fixed point and Floating point operations.

UNIT IV   PROCESSOR DESIGN   9

Processor basics – CPU Organization – Data path design – Control design – Basic concepts – Hardwired control – Micro programmed control – Pipeline control – Hazards – Super scalar operations

UNIT V   MEMORY, I/O SYSTEM AND PARALLEL PROCESSING   9

Memory technology – Memory systems – Virtual memory – Caches – Design methods – Associative memories – Input/output system – Programmed I/O – DMA and Interrupts – I/O Devices and Interfaces - Multiprocessor Organization – Symmetric multiprocessors – Cache Coherence.

TOTAL: 45 Periods

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, Safwat Zaky and NaraigManjikian	Computer organization and Embedded Systems	Tata McGraw Hill	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.	Charles H.Roth, Jr.	Fundamentals of Logic Design	Jaico Publishing House, Mumbai	2002
2.	David A. Patterson and John L. Hennessy	Computer Organization and Design: The Hardware/Software Interface	Morgan Kaufmann / Elsevier	2009
3.	John P. Hayes	Computer Architecture and Organization	Tata McGraw Hill	2000

WEB URLs:

1. www.cuemath.com/numbers/number-systems/
2. www.geeksforgeeks.org/flip-flop-types-their-conversion-and-applications/
3. www.gatevidyalay.com/addressing-modes/
4. www.javatpoint.com/design-of-control-unit
5. www.brainkart.com/article/DMA-and-Interrupts_8636/

21MCB02	DATA STRUCTURES AND ALGORITHMS	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCB02.CO1 : Select and apply the data structure to suit any given problem.
21MCB02.CO2 : Design their own data structure according to the application need.
21MCB02.CO3 : Apply the algorithm design techniques to any of the real world problem.
21MCB02.CO4 : Develop any new application with the help of data structures and algorithms.
21MCB02.CO5 : write efficient algorithm for a given problem and able to analyze its time complexity.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB02.CO1	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCB02.CO2	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCB02.CO3	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCB02.CO4	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCB02.CO5	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-

UNIT I   LINEAR DATA STRUCTURES   9

Introduction - Abstract Data Types (ADT) – Arrays and its representation –Structures – Stack – Queue– Circular Queue - Applications of stack – Infix to postfix conversion – evaluation of expression – Applications of Queue - Linked Lists – Doubly Linked lists – Applications of linked list – Polynomial Addition.

UNIT II   TREE STRUCTURES   9

Need for non-linear structures – Trees and its representation – Binary Tree – expression trees – Binary tree traversals – left child right sibling data structures for general trees – applications of trees – Huffman Algorithm - Binary search tree.

UNIT III   GRAPHS   9

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

UNIT IV   INTRODUCTION TO ALGORITHMS   9

Introduction – Notion of Algorithm – Fundamentals of Algorithmic problem solving – Important problem types – Mathematical analysis for recursive & non recursive algorithms – Brute Fore – Selection Sort – Bubble Sort.

UNIT V   ALGORITHM DESIGN AND ANALYSIS   9

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

TOTAL: 45 Periods

TEXT BOOKS:

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

REFERENCE BOOKS:

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

WEB URLs:

1. https://www.geeksforgeeks.org/difference-between-linear-and-non-linear-data-structures/
2. https://www.javatpoint.com/tree
3. https://www.tutorialspoint.com/data_structures_algorithms/graph_data_structure.htm
4. https://www.geeksforgeeks.org/introduction-to-algorithms/
5. https://www.javatpoint.com/daa-tutorial

21MCB06	DATA STRUCTURES AND ALGORITHMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- 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.

COURSEOUTCOMES:

21MCB06.CO1   Able to select and apply the data structure to suit any given problem.
21MCB06.CO2 Able to design their own data structure according to the application need.
21MCB06.CO3 Able to apply the algorithm design techniques to any of the real world problem.
21MCB06.CO4 Able to develop any new application with the help of data structures and algorithms.
21MCB06.CO5 Able to write efficient algorithm for a given problem and able to analyze its time complexity.

Course Outcomes	ProgramOutcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB06.CO1	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCB06.CO2	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCB06.CO3	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCB06.CO4	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCB06.CO5	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-

LIST OF EXPERIMENTS

1. Polynomial Addition using array.
2. Array implementation of stack.
3. Array implementation of Queue.
4. Infix to postfix 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: 45 Periods**

21MCB03	RELATIONAL DATABASE MANAGEMENT SYSTEMS	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- 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 an query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

COURSE OUTCOMES:

21MCB03.CO1	:	Understand the basic concepts of the database and data models.
21MCB03.CO2	:	Design a database using ER diagrams and map ER into Relations and normalize the relations.
21MCB03.CO3	:	Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
21MCB03.CO4	:	Develop a simple database applications using normalization.
21MCB03.CO5	:	Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB03.CO1	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB03.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB03.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB03.CO4	X	X	X	-	-	X	-	-	-	X	-	X	X	-	-
21MCB03.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 Modeling using Entity– Relationship Model – Enhanced E-R Modeling.

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: 45 Periods

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	McGraw Hil	2010
2.	C.J. Date	An Introduction to Database Systems	Pearson Education	2008
3.	Peter Rob, Carlos Coronel	Database System Concepts	Cengage Learning	2008

REFERENCE BOOKS:

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

WEB URLs:

1. https://www.youtube.com/watch?v=S_P2yyQuB8M
2. https://www.youtube.com/watch?v=P8n_rwPzdBc
3. https://www.youtube.com/watch?v=8RqtFpHkUsQ
4. https://www.youtube.com/watch?v=_ChkXLOabZw
5. https://www.youtube.com/watch?v=AkoBIEGPLfg

21MCB07	RELATIONAL DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- 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 an query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

COURSE OUTCOMES:

21MCB07.CO1	Understand the basic concepts of the database and data models.
21MCB07.CO2	Design a database using ER diagrams and map ER into Relations and normalize the relations.
21MCB07.CO3	Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
21MCB07.CO4	Develop a simple database applications using normalization.
21MCB07.CO5	Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB07.CO1	x	x	x	x	x	x	-	-	x	x	-	x	x	x	-
21MCB07.CO2	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
21MCB07.CO3	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
21MCB07.CO4	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
21MCB07.CO5	x	x	x	x	x	x	-	-	x	x	-	x	x	x	-

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 SQLServer Triggers–Block Level –Form Level Triggers.
8. Working with Forms, Menus and Report Writers for a application project in any domain.

TOTAL: 45 Periods

21MCB04	PROBLEM SOLVING AND PYTHON PROGRAMMING	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCB04.CO1 : Develop algorithmic solutions to simple computational problems
21MCB04.CO2 : Develop and execute simple Python programs
21MCB04.CO3 : Decompose a Python program into functions
21MCB04.CO4 : Represent compound data using Python lists, tuples, dictionaries etc.
21MCB04.CO5 : Read and write data from/to files in Python programs

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB04.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCB04.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB04.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB04.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB04.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 – Pseudocodes 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, Slicing, Comparing, Iterating – Basic Built-In String Functions – Dictionary: Creating, Accessing, Adding Items, Modifying, Deleting, 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: 45 Periods

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 V Guttag	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-Graw Hill Education (India) Private Ltd	2015
5.	Kenneth A. Lambert	Fundamentals of Python: First Programs	Cengage Learning	2012

WEB URLs:

1. https://www.w3schools.com/python
2. https://www.tutorialspoint.com/python
3. https://www.programiz.com/python-programming
4. https://www.javatpoint.com/python-tutorial
5. https://www.learnpython.org

21MCB08	**PYTHON PROGRAMMING LABORATORY**	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- 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:

21MCB08.CO1	Develop algorithmic solutions to simple computational problems
21MCB08.CO2	Develop and execute simple Python programs
21MCB08.CO3	Decompose a Python program into functions
21MCB08.CO4	Represent compound data using Python lists, tuples, dictionaries etc.
21MCB08.CO5	Read and write data from/to files in Python programs

Course Outcomes	ProgramOutcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB08.CO1	X	X	X	X	X	X	-	-	X	X	-	X	X	X	-
21MCB08.CO2	X	X	X	X	X	X	-	-	X	X	-	-	X	X	-
21MCB08.CO3	X	X	X	X	X	X	-	-	X	X	-	-	X	X	-
21MCB08.CO4	X	X	X	X	X	X	-	-	X	X	-	-	X	X	-
21MCB08.CO5	X	X	X	X	X	X	-	-	X	X	-	X	X	X	-

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, car race etc.

. **Total: 45 periods**

21MCB05	OPERATING SYSTEMS	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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 an query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

COURSE OUTCOMES:

21MCB05.CO1	:	Able to understand the operating system components and its services
21MCB05.CO2	:	Implement the algorithms in process management and solving the issues of IPC
21MCB05.CO3	:	Able to demonstrate the mapping between the physical memory and virtual memory
21MCB05.CO4	:	Able to understand file handling concepts in OS perspective
21MCB05.CO5	:	Able to understand the operating system components and services with the recent OS

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB05.CO1	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB05.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB05.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB05.CO4	X	X	X	-	-	X	-	-	-	X	-	X	X	-	-
21MCB05.CO5	X	X	X	-	X	X	-	-	X	X	-	X	X	-	-

UNIT-I   INTRODUCTION   9

Introduction: Types of operating systems – System components – Operating system services – System calls – System programs. Processes: Process concept – Process scheduling – Operations on processes - Co-operating processes – Interprocess communications

UNIT-II   PROCESS SCHEDULING & SYNCHRONIZATION   9

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiprocessor Scheduling. Process Synchronization: Threads – Multithreading Models – Critical Section problem – Semaphores – Classical problems of synchronization – Critical regions – Monitors. Deadlocks: Deadlock Characterization – Deadlock Prevention – Deadlock Avoidance- Deadlock Detection and Recovery.

UNITIII   MEMORY MANAGEMENT   9

Memory Management – Contiguous Memory Allocation – Swapping – Overlays – Fragmentation – Compaction – Paging – Segmentation – Paged Segmentation. Virtual Memory – Demand Paging – Page Replacement – Page Replacement Algorithm – Thrashing.

UNITIV   DISK SCHEDULING AND FILE MANAGEMENT   9

Disk Structures – Disk Scheduling – File Systems Interface – File concepts – Access methods – Directory Structures – File Systems structures – Directory Implementation – Allocation Methods – Free Space management.

UNIT-V   CASE STUDY   9

DOS: Process and Memory Management - LINUX: Process and Memory Management - Windows NT: Process and Memory Management.

TOTAL: 45 Periods

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	McGraw Hil	2010
2.	C.J. Date	An Introduction to Database Systems	Pearson Education	2008
3.	Peter Rob, 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 MDhamdhere	Operating Systems: A Concept-based Approach", Second Edition,	Tata McGraw-Hill Education, 2007.	2007

WEB URLs:

1. www.tutorialspoint.com/working-or-operating-systems/

2. www.edx.org/en-us

3. www.udacity.com/course/introduction/

4. www.saylor.org/course/cs401

5. https://www.youtube.com/watch?v=Sz5XG6tTEv8

21MCB09	DATA COMMUNICATION AND NETWORKS	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- To understand networking concepts and basic communication model.
- To understand network architecture and components required for data communication
- To analyze the function and design strategy of Physical and Data link Layer
- To analyze the function design strategy of Network and Transport Layer
- To Acquire knowledge of various application protocol standard developed for internet

COURSE OUTCOMES:

21MCB09.CO1	:	Able to Identify the components required to build different types of networks
21MCB09.CO2	:	Understand the functionalities needed for data communication into layers
21MCB09.CO3	:	To choose the required functionality at each layer for given application
21MCB09.CO4	:	To understand the working principles of various application protocols
21MCB09.CO5	:	Acquire knowledge about security issues and services available.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB09.CO1	X	X	X	-	-	-	-	-	-	-	-	X	X	-	-
21MCB09.CO2	X	X	X	-	-	-	X	-	X	X	-	X	X	-	-
21MCB09.CO3	X	X	X	-	X	-	X	-	X	X	-	X	X	-	-
21MCB09.CO4	X	X	X	-	X	-	X	-	X	X	-	X	X	-	-
21MCB09.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 S ervices- Cryptography - DES- RSA- W eb security -SSL.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Forouzan	Data Communication and Networking	TMH	2012
2.	Larry L. Peterson & Bruce S. Davie	Computer Networks – A systems Approach	Harcourt Asia / 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.Tannenbaum David J.Wetherall	Computer Networks	Pearson Education	2011
2.	James F. Kurose, Keith W. Ross	Computer Networking: A Top-down Approach	Pearson Education	2012
3.	John Cowley	Communications and Networking : An Introduction	Springer Indian Reprint	2010

WEB URLs:

1. www.tutorialspoint.com/communication_technologies/communication_technologies_transmisson_media.htm
2. www.coursera.org/lecture/iot-wireless-cloud-computing/4-3-wi-fi-standards-part-1-QmD20
3. www.guru99.com/difference-ipv4-vs-ipv6.html
4. www.tutorialspoint.com/what-are-the-services-provided-by-the-transport-layer
5. www.section.io/engineering-education/cryptography-in-computer-networking

21MCB10	SOFTWARE ENGINEERING	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- 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

COURSE OUTCOMES:

21MCB10.CO1 : Get an insight into the processes of software development
21MCB10.CO2 : Able to understand the problem domain for developing SRS and various models of software
21MCB10.CO3 : Able to Model software projects into high level design using DFD,UML diagrams
21MCB10.CO4 : Able to Measure the product and process performance using various metrics
21MCB10.CO5 : Able to Evaluate the system with various testing techniques and strategies

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB10.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCB10.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB10.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB10.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB10.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 – Dataflow 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: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Roger S. Pressman	Software Engineering: A Practitioner Approach	McGraw Hil	2010
2.	Richard Fairley	Software Engineering Concepts	Tata McGraw Hill Edition	2008
3.	Ali Behforroz, 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.	Sommerville	Software Engineering	Addison Wesley-Longman	2004
2.	Kassem A. Saleh	Software Engineering	J.Ross Publishing	2009
3.	Pankaj Jalote	An Integrated approach to Software Engineering	Springer Verlag	2005
4.	Jibitesh Mishra, Ashok Mohanty	Software Engineering	Pearson Education, First Edition	2012

WEB URLs:

1. https://www.youtube.com/watch?v=1MGNuW0HjFA
2. https://www.youtube.com/watch?v=Bv84KQGYtr8
3. https://www.youtube.com/watch?v=goaZTAzsLMk
4. https://www.youtube.com/watch?v=bnydxXPN_rI
5. https://www.youtube.com/watch?v=mPwfYxxvVEk

21MCB11	INTERNET AND JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:
- 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 programming
- To provide knowledge on advanced features like Swing, JavaBeans, Sockets.
- To Understand advanced java networking concepts

COURSE OUTCOMES:

21MCB11.CO1 : Understand the internet standards and recent web technologies like Conferencing, newsgroup etc.

21MCB11.CO2 : Able to implement, compile, test and run Java program

21MCB11.CO3 : Make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API

21MCB11.CO4 : Understand the components and patterns that constitute a suitable architecture for a web application using java servlets

: Demonstrate systematic knowledge of backend and front end by developing an appropriate application.

21MCB11.CO5

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB11.CO1	X	X	X	-	X	-	-	-	X	-	-	X	X	-	-
21MCB11.CO2	X	X	X	X	X	-	-	-	X	-	-	X	X	-	-
21MCB11.CO3	X	X	X	X	X	--	-	-	X	-	-	X	X	-	-
21MCB11.CO4	X	X	X	X	X	-	-	-	X	-	-	X	X	-	-
21MCB11.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 BeanInfo Interface – Persistence- Java Beans API – Using Bean Builder - Networking Basics - Java and the Net – InetAddress – TCP/IP Client Sockets – TCP/IP Server Sockets

TOTAL: 45 Periods

TEXT BOOKS:

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

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Joyce Farrell	Java Programming	Cengage Learning	2011
2.	C. Xavier	Java Programming: A Practical Approach	Tata McGraw Hill	2011
3.	Keyur shah	Gateway to Java Programmer Sun Certification	Tata McGraw Hill	2002
4.	Poornachandra Sarang	Java Programming	McGraw Hill Professional	2012
5.	Herbert Schildt, Dale Skrien	Java Fundamentals – A Comprehensive Introduction	Tata McGraw Hill	2013

WEB URLs:

1.https://cs.lmu.edu/~ray/notes/inetapps/
2.https://www.tutorialspoint.com/java/index.htm
3.https://www.w3schools.com/java/java_packages.asp
4.https://www.javatpoint.com/java-inner-class
5.http://networkprogrammingnotes.blogspot.com/p/java-beans.html

21MCB14	INTERNET PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- 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 serve side programming
- To provide knowledge on advanced features like Swing, JavaBeans, Sockets.

COURSE OUTCOMES:

21MCB14.CO1   :   Able to understand the internet standards and recent web technologies like Conferencing, newsgroup etc.

21MCB14.CO2   :   Able to implement, compile, test and run Java program

21MCB14.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

21MCB14.CO4   :   Able to understand the components and patterns that constitute a suitable architecturefor a web application using java servlets

21MCB14.CO5   :   Able to demonstrate systematic knowledge of backend and front end bydeveloping an appropriate application.

Course Outcomes	ProgramOutcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB14.CO1	x	x	x	-	x	-	-	-	x	-	-	x	x	-	-
21MCB14.CO2	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-
21MCB14.CO3	x	x	x	x	x	--	-	-	x	-	-	x	x	-	-
21MCB14.CO4	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-
21MCB14.CO5	x	x	x	x	x	-	-	-	x	-	-	x	x	-	-

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: 45 Periods

21MCB12	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- 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 gain knowledge about open-source tools for Computer Aided Software Engineering

COURSE OUTCOMES:

21MCB12.CO1 : Able to understand the object-oriented concepts and to apply object-oriented life cycle model for a project

21MCB12.CO2 : Able to design static and dynamic models using UML diagrams.

21MCB12.CO3 : Able to perform object-oriented analysis to identify the objects from the problem specification.

21MCB12.CO4 : Able to identify and refine the attributes and methods for designing the object-oriented

21MCB12.CO5 : Able learn the open source CASE tools and to apply them in various domains.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB12.CO1	X	X	X	X	-	-	-	-	X	X	-	X	X	-	-
21MCB12.CO2	X	X	X	X	X	X	-	-	X	X	-	X	X	-	-
21MCB12.CO3	X	X	X	X	X	X	-	-	X	X	-	X	X	-	-
21MCB12.CO4	X	X	X	X	X	X	-	-	X	X	-	X	X	-	-
21MCB12.CO5	X	X	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

Identifying Use case – Business object analysis – Use case driven object oriented analysis – Use case model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility – construction of class diagram for generalization, aggregation – example – vehicle class.

UNIT IV   OBJECT ORIENTED DESIGN   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 – 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: 45 Periods

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	3rd Edition, Pearson Education	2005
2.	Grady Booch, James Rumbaugh, Ivar Jacobson	The Unified Modeling Language User Guide	Addison Wesley Long man	1999
3.	Martin Fowler	UML Distilled A Brief Guide to Standard Object Modeling Language	3rd Edition, Addison Wesley	2003
4.	M.N.Bandyopadhyay	Learning UML 2.0 .	O"Reilly	2008

WEB URLs:

1. https://www.youtube.com/watch?v=rflyvpMvVtM
2. https://youtu.be/rPJ25XZflaE
3. https://www.youtube.com/watch?v=uwAY1ZOo0jc
4. https://www.youtube.com/watch?v=R1foYaLzo0A
5. https://www.youtube.com/watch?v=_74Nra8h5Go

21MCB15	SOFTWARE DEVELOPMENT- CASE TOOLS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- 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 deliverables.
- To understand the software engineering methodologies for project development.
-

COURSEOUTCOMES:

21MCB15.CO1 : Use software's to design an application using Object Oriented approach

21MCB15.CO2 : Apply suitable design patterns in system design

21MCB15.CO3 : Critique Object Oriented analysis and system design using Object Oriented Principles

21MCB15.CO4 : Ability to generate a high-level design of the system from the software requirements

21MCB15.CO5 : Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

Course Outcomes	ProgramOutcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB15.CO1	X	X	X	X	-	-	-	-	X	X	-	X	X	-	-
21MCB15.CO2	X	X	-	X	X	X	-	-	X	X	-	X	X	-	-
21MCB15.CO3	X	X	X	-	X	X	-	-	X	X	-	X	X	-	-
21MCB15.CO4	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
21MCB15.CO5	X	X	X	X	X	X	-	-	X	X	-	X	X	-	-

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 codegenerators
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:
   1. Library System
   2. Student Marks Analyzing System
   3. Text Editor
   4. Create a dictionary
   5. Telephone directory.
   6. Inventory System

TOTAL: 45 Periods

21MCB13	BIG DATA ANALYTICS	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCB13.CO1 : Work with big data platform and understand the fundamentals of various big data analysis techniques
21MCB13.CO2 : Analyze the big data analytic techniques for useful business applications
21MCB13.CO3 : Design efficient algorithms for mining the data from large volumes
21MCB13.CO4 : Analyze the HADOOP and Map Reduce technologies associated with big data analytics.
21MCB13.CO5 : Explore the applications of Big Data

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB13.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCB13.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB13.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB13.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB13.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 filesystems-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 – PageRank - Efficient Computation of PageRank- Topic-Sensitive PageRank – 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, DataFrame, 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 ndarrays / 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: 45 Periods

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.	Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos	Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data	McGraw Hill Publishing	2012
3.	Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets	Intelligent Data Mining	Springer	2007
4.	Franks	Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics	John Wiley & sons	2012
5.	Glenn J. Myatt	Making Sense of Data	John Wiley & Sons	2007
6.	Jiawei Han, Micheline Kamber	Data Mining Concepts and Techniques	Elsevier	2008

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Michael Berthold, David J. Hand	Intelligent Data Analysis	Springer	2007
2.	Michael Minelli, Michele Chambers , Ambiga Dhiraj	Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses	Wiley Publications	2013
3.	Paul Zikopoulos, DirkdeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corrigan	Harness the Power of Big Data The IBM Big Data Platform	TataMcGrawHill Publications	2012
4.	Tom White	Hadoop: The Definitive Guide	O"reilly Media	2015

WEB URLs:

1. https://www.oracle.com/big-data/free-eb
2. https://www.analyticsvidhya.com › resources-big-data
3. https://www.simplilearn.com › Resources › Big Data
4. https://www.ibm.com › Analytics › Hadoop
5. https://www.qubole.com › big-data-analytics

21MCB16	DATA ANALYTICS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:
- 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:

21MCB16.CO1: Work with big data platform and understand the fundamentals of
variousBig data analysis techniques

21MCB16.CO2: Analyze the big data analytic techniques for useful business applications

21MCB16.CO3: Design efficient algorithms for mining the data from large volumes

21MCB16.CO4: Analyze the HADOOP and Map Reduce technologies associated with big data
Analytics.

21MCB16.CO5: Explore the applications of Big Data

Course Outcomes	ProgramOutcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB16.CO1	x	x	x	x	x	x	-	-	x	x	-	x	x	x	-
21MCB16.CO2	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
21MCB16.CO3	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
21MCB16.CO4	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-
21MCB16.CO5	x	x	x	x	x	x	-	-	x	x	-	x	x	x	-

LIST OF EXPERIMENTS

Hadoop
1. Install, configure and run Hadoop and HDFS Python programming using simple statements and expressions.
2. Implement word count / frequency programs using MapReduce .
3. Implement an MR program that processes a weather dataset.

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: 45 periods

21MCC01	**SOFTWARE PROJECT MANAGEMENT**	**L T P C**
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCC01.CO1	:	Understand the activities during the project scheduling of any software application.
21MCC01.CO2	:	Learn the risk management activities and the resource allocation for the projects.
21MCC01.CO3	:	Can apply the software estimation and recent quality standards for evaluation of the software
21MCC01.CO4	:	Acquire knowledge and skills needed for the construction of highly reliable software project
21MCC01.CO5	:	Understand the activities during the project scheduling of any software application.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC01.CO1	x	x	x	-	-	-	-	-	-	-	-	x	x	-	-
21MCC01.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
21MCC01.CO3	x	x	x	x	x	x	-	-	x	x	x	x	x	-	-
21MCC01.CO4	x	x	x	x	x	-	-	-	x	-	x	x	x	-	-
21MCC01.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 inbuilding 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- openProj. Case study: PRINCE2.

TOTAL: 45 Periods

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

WEB URLs:

1. https://www.youtube.com/watch?v=0RmBrKxwCz8
2. https://www.youtube.com/watch?v=GJyEL0F0lDc
3. https://www.youtube.com/watch?v=uWlQNTQ7mfo
4. https://www.youtube.com/watch?v=TcKoUe8vRE0
5. https://www.youtube.com/watch?v=twr_jEpkCHM

21MCC02	WEB TECHNOLOGIES	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCC02.CO1	:	Explore markup languages features and create interactive web pages using them
21MCC02.CO2	:	Learn and design Client side validation using scripting languages
21MCC02.CO3	:	Acquire knowledge about Open source JavaScript libraries
21MCC02.CO4	:	Able to design front end web page and connect to the back end databases
21MCC02.CO5	:	Explore markup languages features and create interactive web pages using them.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC02.CO1	X	X	X	X	X	X	-	-	X	-	X	X	X	X	-
21MCC02.CO2	X	-	X	X	X	-	-	-	-	X	X	X	X	X	-
21MCC02.CO3	X	X	X	-	X	X	-	-	X	X	X	-	X	-	-
21MCC02.CO4	X	X	X	X	-	-	-	-	-	X	-	X	X	X	-
21MCC02.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: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel	Internet and World Wide Web - How To Program	Pearson Education	2011
2.	Achyut S Godbole and AtulKahate	Web Technologies	Tata McGraw Hill	2012
3.	Steven Holzner	The Complete Reference - PHP	Tata McGraw Hill	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 McGraw Hill	2013
2.	David Flanagan	JavaScript: The Definitive Guide	O'Reilly Media	2011
3.	Mike Mcgrath.	PHP & MySQL in easy Steps	Tata McGraw Hill	2012

WEB URLs:

1. www.cloudflare.com/en-in/learning/ddos/glossary/hypertext-transfer-protocol-http/
2. www.elprocus.com/tcp-ip-protocol-architecture-and-its-layers/
3. www.tutorialspoint.com/css/index.htm
4. www.w3schools.com/js/
5. www.javatpoint.com/php-tutorial

21MCC03	E- LEARNING	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCC03.CO1	:	Distinguish the phases of activities in models of E-learning.
21MCC03.CO2	:	Identify appropriate instructional methods and delivery strategies.
21MCC03.CO3	:	Choose appropriate E-learning Authoring tools.
21MCC03.CO4	:	Create interactive E-learning courseware.
21MCCO3.CO5	:	Analysis about various E-Learning Solutions.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC03.CO1	X	X	X	-	-	-	-	-	-	-	-	X	X	-	-
21MCC03.CO2	X	X	X	-	-	X	-	-	-	X	-	X	X	-	-
21MCC03.CO3	X	X	X	-	X	X	-	-	X	X	-	X	X	-	-
21MCC03.CO4	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCC03.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 – Act to 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-Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-Learning Methods and Delivery Formats – Using Communication Tools for E-Learning – Course Evaluation.

TOTAL: 45 Periods

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	McGraw Hil, Third Edition	2011
2.	Crews, T. B., Sheth, S. N., Horne, T. M	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	1st Edition, University Press	2011.

WEB URLs:

1. https://www.youtube.com/watch?v=Y9QQGFJHKxY

2. https://www.youtube.com/watch?v=k2IycC6-INM

3. ttps://www.youtube.com/watch?v=K5ZWRJsqqDw
4. https://www.youtube.com/channel/UCpXj6wP3ONwFaoPHIxF9-HQ
5. https://www.youtube.com/watch?v=bTU9bo4kKYI

21MCC04	SOFTWARE QUALITY AND TESTING	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCC04.CO1 : Up on completion of the course the students will be able to choose the software testing

21MCC04.CO2 : Identify the components of software quality assurance systems

21MCC04.CO3 : Apply various software testing strategies

21MCC04.CO4 : Design and develop software quality models

21MCC04.CO5 : Make use of statistical methods in software quality.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC04.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCC04.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCCO4.CO3	X	X	X	X	X	X	X	-	X	X	X	X	X	-	-
21MCC04.CO4	X	X	X	X	X	X	X	-	X	X	X	X	X	-	-
21MCC04.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 AREAS 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: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William E.Lewis	Software Testing and Continuous Quality Improvement	3rdEdition, Auerbach Publications	2011
2.	KshirasagarNaik and PriyadarshiTripathy	Software Testing and Quality Assurance Theory and Practice	2nd Edition, John Wiley & Sons Publication	2011
3.	Ron Patton	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 Press Taylor & Francis Group, Fourth Edition	2018

WEB URLs:

1. https://www.youtube.com/watch?v=BBmA5Qp6Ghk
2. https://www.youtube.com/watch?v=T3q6QcCQZQg
3. https://www.youtube.com/watch?v=JjHVlcEKIPQ
4. https://www.youtube.com/watch?v=u3HC3aS76ow
5. https://www.youtube.com/watch?v=QOy2gYuWxSc

21MCC05	ADVANCES IN OPERATING SYSTEMS	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCC05.CO1	:	Discuss the various synchronization, scheduling and memory management issues
21MCC05.CO2	:	Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
21MCC05.CO3	:	Discuss the various resource management techniques for distributed systems
21MCC05.CO4	:	Identify the different features of real time and mobile operating systems
21MCC05.CO5	:	Install and use available opensource kernel

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC05.CO1	X	X	X	-	-	-	-	-	X	-	-	X	X	-	-
21MCC05.CO2	X	X	X	-	-	-	-	X	X	X	-	X	X	-	-
21MCC05.CO3	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC05.CO4	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC05.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

IIssues 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 – Nonblocking 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 – Inter process Communication. iOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Abraham Silberschatz, Peter Baer Galvin,	Operating System Concepts-Essentials	John Wiley & Sons	2013
2.	Mukesh Singhal, NiranjanG. Shivaratri,	Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems	TATA McGraw Hill	1994

REFERENCE BOOKS:

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

WEB URLs:

1. www.tutorialspoint.com/operating_system/os_process_scheduling.htm
2. www.geeksforgeeks.org/mutual-exclusion-in-distributed-system/
3. www.tutorialspoint.com/operating_system/os_process_scheduling_algorithms.htm
4. www.uswitch.com/mobiles/guides/mobile-operating-systems/
5. www.geeksforgeeks.org/inter-process-communication-ipc/

21MCB17	MOBILE COMPUTING	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCB17.CO1	:	Gain the knowledge about various types of Wireless Data Networks and Voice Networks
21MCB17.CO2	:	understand the architectures, the challenges and the Solutions of Wireless Communication
21MCB17.CO3	:	Realize the role of Wireless Protocols in shaping the future Internet.
21MCB17.CO4	:	Able to develop simple Mobile Application Using Android
21MCB17.CO5	:	Able to develop Advanced Mobile Application Using Android

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB17.CO1	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-
21MCB17.CO2	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-
21MCB17.CO3	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-
21MCB17.CO4	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-
21MCB17.CO5	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-

**UNIT I   LOGIC AND PROOFS WIRELESS COMMUNICATION FUNDAMENTALS,   9
ARCHITECTURE**

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 SHOR 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 - I   9

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

UNIT V   MOBILE APPLICATION DEVELOPMENT USING ANDROID – II   9

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

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Asoke K Talukder, Hasan Ahmed,Roopa R Yavagal	Mobile Computing	Tata McGraw Hill	2010
2.	Barry A. Burd	Android Application Development For Dummies All in One	Wiley	2015
3.	Ed Burnette,"Hello	Android: Introducing Google"s Mobile Development Platform	Pragmatic Programmers	2012
4.	Jochen Schillar	Mobile Communications	Pearson Education	

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jerome(J.F) DiMarzio	Android A programmer"s Guide	Tata McGraw Hill	2010
2.	Maritn Sauter	From GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband	John Wiley and Sons	2011
3.	Raj Kamal	Mobile Computing	Oxford Higher Education	2012
4.	Reto Meier	Professional Android 2 Application Development, Wrox"s Programmer toProgrammer series.	McGraw Hill Professional	2012

WEB URLs:

1. https://www.geeksforgeeks.org/gsm-in-wireless-communication/
2. https://www.rohm.com/electronics-basics/wireless/short-range-wireless-communication
3. https://www.geeksforgeeks.org/mobile-internet-protocol-or-mobile-ip/
4. https://developer.android.com/training/basics/firstapp
5. https://developer.android.com/codelabs/build-your-first-android-app#0

21MCB19	**MOBILE APPLICATION DEVELOPMENT LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES

- 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

COURSEOUTCOMES:

21MCB19.CO1 : Gain the knowledge about various types of Wireless Data Networks and Voice Networks.
21MCB19.CO2 : Understand the architectures, the challenges and the Solutions of Wireless Communication.
21MCB19.CO3 : Realize the role of Wireless Protocols in shaping the future Internet.
21MCB19.CO4 : Able to develop simple Mobile Application Using Android
21MCB19.CO5 : Able to develop Advanced Mobile Application Using Android

Course Outcomes	Program Outcomes												PSOs		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
21MCB19.CO1	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-
21MCB19.CO2	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-
21MCB19.CO3	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-
21MCB19.CO4	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-
21MCB19.CO5	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-

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 Multithreading.

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: 45 Periods

21MCB18	NETWORK PROGRAMMING	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- To understand inter process and inter-system communication
- To understand protocols used in network 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:

21MCB18.CO1 : To write socket API based programs
21MCB18.CO2 : To design and implement client-server applications using TCP sockets
21MCB18.CO3 : To design and implement client-server applications using UDP sockets
21MCB18.CO4 : To design and implement client-server application using HTTP protocol
21MCB18.CO5 : To analyze network programs

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB18.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCB18.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB18.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB18.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCB18.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 – Inter process 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 – get socket and set socket 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 – gethost by name function – Ipv6 support in DNS – gethost by adr function –getservbyname and get servbyport 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: 45 Periods

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.A Rago	Programming in the Unix environment	Pearson	2005

WEB URLs:

1. https://www.tutorialspoint.com / unix_sockets
2. https://www.pearson.com / store / unix-network-programming
3. https://ptec.epc-trackeres / uploads/ unix-network-programming
4. https://dl.acm.org / doi / book
5. http://www.kegel.com / unpv1

21MCB20	NETWORK PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To understand inter process and inter-system communication
- To understand protocols used in network 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:

21MCB20.CO1 : Writing socket API based programs
21MCB20.CO2 : Design and implement client-server applications using TCP sockets
21MCB20.CO3 : Design and implement client-server applications using UDP sockets
21MCB20.CO4 : Design and implement client-server application using HTTP protocol
21MCB20.CO5 : Analyzing network programs

Course Outcomes	ProgramOutcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCB20.CO1	X	X	X	X	X	X	-	-	X	X	-	X	X	X	-
21MCB20.CO2	X	X	X	X	X	X	-	-	X	X	-	-	X	X	-
21MCB20.CO3	X	X	X	X	X	X	-	-	X	X	-	-	X	X	-
21MCB20.CO4	X	X	X	X	X	X	-	-	X	X	-	-	X	X	-
21MCB20.CO5	X	X	X	X	X	X	-	-	X	X	-	X	X	X	-

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) UDP Sockets
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: 45 periods

21MCC06	CYBER SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:
- 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:

21MCC06.CO1	:	Develop a set of risk and security requirements to ensure that there are no gaps in an organization's security practices.
21MCC06.CO2	:	Achieve management, operational and technical means for effective cyber security.
21MCC06.CO3	:	Audit and monitor the performance of cyber security controls.
21MCC06.CO4	:	To spot gaps in the system and devise improvements
21MCC06.CO5	:	Identify and report vulnerabilities in the system

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC06.CO1	X	X	X	X	X	X	-	-	X	-	X	X	X	X	-
21MCC06.CO2	X	X	X	X	X	X	X	-	-	X	X	X	X	X	-
21MCC06.CO3	X	X	X	-	X	X	-	X	X	X	-	-	X	-	-
21MCC06.CO4	X	X	X	X	-	-	X	-	-	X	-	X	X	X	-
21MCC06.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 securitypolicies

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 cryptographic 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: 45 Periods

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.	Adam Shostack	Threat Modelling- Designing for Security	Wiley Publications	2014
2.	Gregory J. Touhill and C. Joseph Touhill	Cyber Security for Executives- A Practical guide	Wiley Publications	2014
3.	RaefMeeuwisse	Cyber Security for Beginners	Cyber Simplicity Ltd,	2017
4.	Patrick Engebretson	The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy	Syngres	2013

WEB URLs:

1. www.vectorsolutions.com/resources/blogs/three-phases-risk-assessment-risk-management-basics/
2. www.sciencedirect.com/topics/computer-science/industrial-control-system
3. www.csoonline.com/article/3251714/what-is-access-control-a-key-component-of-data-security.html
4. www.crowdstrike.com/cybersecurity-101/vulnerability-management/
5. www.searchcompliance.techtarget.com/definition/risk-reporting

21MCC07	C# AND .NET PROGRAMMING	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- To learn the technologies of .NET framework
  To cover all segments of programming in C# starting from the language basis, followed by 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:

21MCC07.CO1 : Understand the difference between .NET and Java framework
21MCC07.CO2 : Work with the basic and advanced features of C# language
21MCC07.CO3 : Create applications using various data providers
21MCC07.CO4 : Create web application using ASP.NET
21MCC07.CO5 : Create mobile application using .NET compact framework

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC07.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCC07.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC07.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC07.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC07.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

Delegates – Lambdas – Lambda Expressions – Events – Event Publisher – Event Listener – Strings and Regular Expressions – Generics – Collections – Memory Management and Pointers – Errors and Exceptions – Reflection.

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: 45 Periods

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 .NET 4.5 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	Tata McGraw Hill	2010

WEB URLs:

1. https://docs.microsoft.com › .NET fundamentals
2. https://www.c-sharpcorner.com › topics › net-framework
3. https://www.dotnetcurry.com › patterns-practices
4. https://intelequia.com › blog › post › custom-languages.
5. https://www.aspsnippets.com › Articles › ASPNet-Global

21MCC08	WIRELESS NETWORKING	L T P C
		3 0 0 3

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

COURSE OUTCOMES:

21MCC08.CO1 : Conversant with the latest 3G/4G networks and its architecture
21MCC08.CO2 : Design and implement wireless network environment for any application using latest wireless protocols and standards
21MCC08.CO3 : Ability to select the suitable network depending on the availability and requirement
21MCC08.CO4 : Implement different type of applications for smart phones and mobile devices with latest network strategies
21MCC08.CO5 : Explore the architecture of 5G, 5G Modulation Schemes

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC08.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCC08.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC08.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC08.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC08.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 layerin 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: 45 Periods

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.	Clint Smith, Daniel Collins	Wireless Networks	McGraw-Hill Education	2014
2.	Anurag Kumar, D.Manjunath, Joy kuri	Wireless Networking	Elsevier	2011
3.	Xiang, W; Zheng, K; Shen, X.S	5G Mobile Communications	Springer	2016
4.	Saad Z Asif	5G Mobile Communication, Concepts and Challenges	CRC Press	-
5.	Thomas L. Marzetta, Erik G. Larsson, Hong Yang,HienQuoc Ngo	Fundamentals of Massive MIMO	Cambridge University Press	2018

WEB URLs:

1. https://solutionsreview.com › wireless-network
2. https://nsrc.org › archives › wireless
3. https://web.stanford.edu › class › previous › lectures
4. https://www.sciencedirect.com › topics › computer-science
5. https://liu.se › research › resource-allocation-and-energy

21MCC09	WEB DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:
- 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:

21MCC09.CO1	:	Create a basic website using HTML and Cascading Style Sheets.
21MCC09.CO2	:	Create websites with complex layouts
21MCC09.CO3	:	Add interactivity to websites using simple scripts
21MCC09.CO4	:	Design rich client presentation using AJAX.
21MCC09.CO5	:	Add business logic to websites using PHP and databases

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC09.CO1	X	X	X	X	X	X	-	-	X	-	X	X	X	X	-
21MCC09.CO2	X	-	X	X	X	-	-	-	-	X	X	X	X	X	-
21MCC09.CO3	X	X	X	-	X	X	-	-	X	X	X	-	X	-	-
21MCC09.CO4	X	X	X	X	-	-	-	-	-	X	-	X	X	X	-
21MCC09.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-FiveGolden 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: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David Flanagan	JavaScript: The Definitive Guide	7th Edition, O'Reilly Publications	2020
2.	Danny Goodman	Dynamic HTML: The Definitive Reference: A Comprehensive Resource for XHTML, CSS, DOM, JavaScript	O'Reilly Publications, 3rd Edition	2007
3.	Robin Nixon	Learning PHP, MySQL, JavaScript & CSS: A Step-by-Step Guide to Creating Dynamic Websites	O'Reilly Publications, 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 Quick start Guide	Peachpit Press, 7th Edition	2012
3.	Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel	Internet and World Wide Web - How to Program	Fifth Edition, Pearson Education	2012

WEB URLs:

1. https://www.youtube.com/watch?v=xs5UlFeU4e4
2. https://www.youtube.com/watch?v=_Hp_dI0DzY4
3. https://www.youtube.com/watch?v=LgaKUcAe71U
4. https://www.youtube.com/watch?v=W6NZfCO5SIk
5. https://www.youtube.com/watch?v=IG94MerheDQ

21MCC10	NETWORK PROGRAMMING AND SECURITY	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCC10.CO1   :   Design and implement the client/server programs using variety of protocols
21MCC10.CO2   :   Understand the key protocols which support Internet
21MCC10.CO3   :   Demonstrate advanced knowledge of programming interfaces for network communication
21MCC10.CO4   :   Use the basic tools for design and testing of network programs in Unix environment
21MCC10.CO5   :   Identify some of the factors driving the need for network security

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC10.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCC10.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC10.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC10.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC10.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 – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write , close functions – Iterative Server – Concurrent Server.

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 socket options – ICMP socket options – TCP socket options I/O multiplexing – I/O Models – select function – shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo 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 and Applications.

TOTAL: 45 Periods

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, Volume 1: The Sockets Networking API	Addison Wesley Pearson Education	2004
2.	Behrouz A Forouzan,Debdeep Mukhopadhyay	Cryptography and Network Security	Tata McGraw Hill Education Private Limited	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.	Andre Perez	Network Security	Publisher John Wiley & Sons	2014
2.	Gary R. Wright , W. Richard Stevens	TCP/IP Illustrated: The Implementation	Addison Wesley Professional	2008
3.	Michael J. Donahoo, Kenneth L. Calvert	TCP/IP Sockets in C: Practical Guide for Programmers	Morgan Kaufmann Publishers	2009
4.	Lewis Van Winkle	Hands-On Network Programming with C: Learn socket programming in C and write secure and optimized network code	Packet Publishing	2019

WEB URLs:

1.   https://www.tutorialspoint.com / unix_sockets
2.   https://www.pearson.com / store/ unix-network-programming
3.   https://ptec.epc-tracker.es / uploads / unix-network-programming
4.   https://dl.acm.org / doi / book
5.   https://www.tutorialspoint.com /network_security

21MCC11	CLOUD COMPUTING TECHNOLOGIES	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- To understand the basic concepts of Distributed system
- 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 Micro services and DevOps

COURSE OUTCOMES:

21MCC11.CO1	:	Use Distributed systems in Cloud Environment
21MCC11.CO2	:	Articulate the main concepts, key technologies, strengths and limitations of Cloud computing
21MCC11.CO3	:	Identify the Architecture, Infrastructure and delivery models of Cloud computing
21MCC11.CO4	:	Install, choose and use the appropriate current technology for the implementation of Cloud
21MCC11.CO5	:	Adopt Microservices and DevOps in Cloud environment

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC11.CO1	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC11.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC11.CO3	X	X	X	-	-	X	-	-	X	X	X	X	X	-	-
21MCC11.CO4	X	X	X	-	-	X	-	-	X	X	X	X	X	-	-
21MCC11.CO5	X	X	X	-	-	-	-	-	X	X	X	X	X	-	-

UNIT I   DISTRIBUTED SYSTEMS   9

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

UNIT II   INTRODUCTION TO CLOUD COMPUTING   9

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

UNIT III   CLOUD INFRASTRUCTURE   9

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

UNIT IV   CLOUD ENABLING TECHNOLOGIES   9

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

UNIT V   MICROSERVICES AND DEVOPS   9

Defining Microservices - Emergence of Microservice Architecture – Design patterns of Microservices – The Mini web service architecture – Microservice dependency tree –Challenges with Microservices - SOA vs Microservice – Microservice and API – Deployingand maintaining Microservices – 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: 45 Periods

TEXT BOOKS:

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

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Richard Rodger	The Tao of Microservices	Manning Publications, First Edition,December	2017
2.	Magnus Larsson	Hands-On Microservices with Spring Boot and Spring Cloud: Buildand deploy microservices using spring cloud, Istio and kubernetes	Packt Publishing Ltd, First Edition,September	2019
3.	Jim Lewis	DEVOPS: A complete beginner's guide to DevOps best practices	ISBN-13:978-1673259148, ISBN-10: 1673259146, First Edition	2019
4.	Richard Rodger	The Tao of Microservices	Manning Publications, First Edition,December	2017

WEB URLs:

1. https://www.youtube.com/watch?v=dX2PSA0si5g
2. https://www.youtube.com/watch?v=RWgW-CgdIk0
3. https://www.youtube.com/watch?v=nRdNgMcKge8
4. https://www.youtube.com/watch?v=qEQqF7iqzYk
5. https://www.youtube.com/watch?v=L4aDJtPYI8M

21MCC12											**L T P C**
			BIO INSPIRED COMPUTING								**3 0 0 3**

COURSE OBJECTIVES:
- 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:

21MCC12.CO1	:	Implement and apply bio-inspired algorithms
21MCC12.CO2	:	Explain random walk and simulated annealing
21MCC12.CO3	:	Implement and apply genetic algorithms
21MCC12.CO4	:	Explain swarm intelligence and ant colony for feature selection
21MCC12.CO5	:	Apply bio-inspired techniques in various fields

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC12.CO1	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCC12.CO2	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCC12.CO3	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCC12.CO4	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCC12.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: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Eiben,A.E.Smith,James E	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-She Yang ,Jaao Paulo papa	Bio-Inspired Computing and Applications in ImageProcessing	Elsevier	2016
2.	Xin-She Yang	Nature Inspired Optimization Algorithm	Elsevier	2014
3.	Yang ,Cui,XIao,Gandomi,Karamanoglu	Swarm Intelligence and Bio-InspiredComputing	Elsevier	2013

WEB URLs:

1.https://en.wikipedia.org/wiki/Bio-inspired_computing
2.https://www.sciencedirect.com/topics/computer-science/random-walk-step
3.https://www.frontiersin.org/articles/10.3389/fbuil.2020.00102/full
4.https://www.sciencedirect.com/topics/engineering/firefly-algorithm
5.https://whatis.techtarget.com/definition/bio-inspired-computing

21MCC13	Information Retrieval Techniques	L T P C
		3 0 0 3

COURSE OBJECTIVES:
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:
21MCC13.CO1 : Implement and apply bio-inspired algorithms
21MCC13.CO2 : Explain random walk and simulated annealing
21MCC13.CO3 : Implement and apply genetic algorithms
21MCC13.CO4 : Explain swarm intelligence and ant colony for feature selection
21MCC13.CO5 : Apply bio-inspired techniques in various fields

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC13.CO1	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCC13.CO2	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCC13.CO3	X	X	X	-	X	-	-	-	X	-	-	X	X	-	-
21MCC13.CO4	X	X	X	-	X	-	-	-	X	-	-	X	X	-	-
21MCC13.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 – Web Characteristics– The impact of the web on IR —IR Versus Web Search–Components of a Search engine.

UNIT II   MODELING   9
Taxonomy and Characterization of IR Models – Boolean Model – Vector Model – Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models – Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing.

UNIT III   INDEXING   9
Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching-Sequential Searching and Pattern Matching. Query Operations –Query Languages – Query Processing - Relevance Feedback and Query Expansion – Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency.

UNIT IV   CLASSIFICATION AND CLUSTERING   9
Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering –Matrix decompositions and latent semantic indexing – Fusion and Meta learning

UNIT V   SEARCHING THE WEB   9
Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries.

TOTAL: 45 Periods

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, Gordon V. Cormack	Information Retrieval	Elsevier	2010
2.	Manning ChristopherD., Raghavan Prabhakar& Schutze Hinrich	Introduction to Information Retrieval	University Press	2009

WEB URLs:

1.https://www.geeksforgeeks.org/what-is-information-retrieval/
2.https://aspoerri.comminfo.rutgers.edu/InfoCrystal/Ch_2.html
3.https://www.analyticsvidhya.com/blog/2021/07/indexing-in-natural-language-processing-for-information retrieval/
4.http://orion.lcg.ufrj.br/Dr.Dobbs/books/book5/chap16.htm
5.https://www.computer.org/csdl/magazine/cs/2004/04/c4043/13rRUxYrbPV

21MCC14	SOFTWARE ARCHITECTURE	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- Understand Software Architectural requirements and drivers
- Be exposed to architectural styles and views
- Be familiar with architectures for emerging technologies

COURSE OUTCOMES:

21MCC14.CO1 : Explain influence of software architecture on business and technical activities

21MCC14.CO2 : Summarize quality attribute workshop

21MCC14.CO3 : Identify key architectural structures

21MCC14.CO4 : Use styles and views to specify architecture

21MCC14.CO5 : Design document for a given architecture

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC14.CO1	X	X	X	-	-	-	-	-		-	-	X	X	-	-
21MCC14.CO2	X	X	X	-	-	-	-		X	X	-	X	X	-	-
21MCC14.CO3	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC14.CO4	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC14.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: 45 Periods

TEXT BOOKS:

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

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Paul Clements, Rick Kazman, and Mark Klein	Evaluating software architectures: Methods and case studies	Addison-Wesley	2001
2.	Mark Hansen	SOA Using Java Web Services	Prentice Hal	2007
3.	David Garlan, Bradley Schmerl, and Shang-Wen Cheng,	Software Architecture Based Self-Adaptation	Springer Verlag	2009

WEB URLs:

1. www.mdpi.com/journal/applsci/special_issues/Architectural_Structure
2. www.brainkart.com/article/Documenting-Quality-Attributes_11282/
3. www.slideshare.net/reejasr/architectural-structures-and-views
4. www.brainkart.com/article/Shared-Information-Style_11294/
5. www.todaysoftmag.com/article/2241/architecture-description-languages

21MCC15	DIGITAL FORENSICS	L T P C
		3 0 0 3

COURSE OBJECTIVES:

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:

21MCC15.CO1 : Explain digital forensic process and role of forensic examiner.
21MCC15.CO2 : Explore Legal amendments.
21MCC15.CO3 : Demonstrate evidence collection
21MCC15.CO4 : Explore computer forensics, network forensics and mobile device forensics.
21MCC15.CO5 : Make Use forensics tools.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC15.CO1	X	X	X	-	X	X	-	-	X	-	-	X	X	-	-
21MCC15.CO2	X	X	X	-	X	X	-	-	-	-	-	X	X	-	-
21MCC15.CO3	X	X	X	-	X	X	-	-	-	-	-	X	X	-	-
21MCC15.CO4	X	X	-	-	X	X	-	-	X	-	-	X	X	-	-
21MCC15.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: 45 Periods

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.	Cory Altheide 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.	Nihad A. Hassan	Digital Forensics Basics: A Practical Guide Using Windows OS	A Press	2019
2.	ThmasJ.Holt, Adam M.Bossler, K.C.Seigfried – Spellar	Cybercrime and Digital Forensics An Introduction	Taylor and Francis	2015
3.	Darren R. Hayes	A Practical Guide to Digital Forensics Investigations	Pearson Education	2020

WEB URLs:

1.www.cipsec.eu/content/introduction-digital-forensics
2.https://www.sciencedirect.com/science/article/pii/
3.http://www.forensicsciencesimplified.org/digital/how.html
4.https://www.guru99.com/digital-forensics.html
5.https://resources.infosecinstitute.com/topic/mobile-forensics-process-steps-types/

21MCC16	DATA MINING AND DATA WAREHOUSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- 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:

21MCC16.CO1 : Identify data mining techniques in building intelligent model.

21MCC16.CO2 : Illustrate association mining techniques on Transactional databases.

21MCC16.CO3 : Apply classification and clustering techniques in real world applications.

21MCC16.CO4 : Evaluate various mining techniques on complex data objects.

21MCC16.CO5 : Design, create and maintain data warehouses.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC16.CO1	X	X	X	-	-	-	-	-	-	-	-	X	X	-	-
21MCC16.CO2	X	X	X	-	-	X	-	X	-	X	-	X	X	-	-
21MCC16.CO3	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC16.CO4	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC16.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 DimensionalData - 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: 45 Periods

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 & Stephen J.Smith	Data Warehousing, Data Mining & OLAP	TATA McGraw Hill	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

WEB URLs:

1. www.analyticsvidhya.com/blog/2021/08/data-preprocessing-in-data-mining-a-hands-on-guide/
2. www.softwaretestinghelp.com/fp-growth-algorithm-data-mining/
3. www.brainkart.com/article/Classification-by-Backpropagation_8324/
4. www.datamining365.com/2020/03/partitional-clustering-k-means.html
5. www.geeksforgeeks.org/multidimensional-data-model/

21MCC18	PROFESSIONAL ETHICS IN IT	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCC18.CO1 : Helps to examine situations and to internalize the need for applying ethical principles, values to tackle with various situations.

21MCC18.CO2 : Develop a responsible attitude towards the use of computer as well as the technology.

21MCC18.CO3 : Able to envision the societal impact on the products/ projects they develop in their career.

21MCC18.CO4 : Understanding the code of ethics and standards of computer professionals.

21MCC18.CO5 : Analyze the professional responsibility and empowering access to information in the work place.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC18.CO1	X	X	X	-	-	-	-	-	-	-	-	X	X	-	-
21MCC18.CO2	X	X	X	-	-	-	-	-	X	X	-	X	X	-	-
21MCC18.CO3	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC18.CO4	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC18.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: 45 Periods

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.	John Weckert and Douglas Adeney	Computer and Information Ethics	Greenwood Press	1997
2.	Penny Duquenoy, Simon Jones and Barry G Blundell	Ethical, legal and professional issues in computing	Middlesex University Press	2008
3.	Sara Baase	A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Interne	Prentice Hall	2008

WEB URLs:

1. www.infosectoday.com/Articles/IntroComputerEthics.html
2. www.routledge.com/The-Rational-Foundations-of-Ethics/Sprigge/p/book/9780367502690
3. www.rankred.com/12-advanced-surveillance-technologies-high-security/ 4.
4. www.finnegan.com/en/insights/articles/trade-secrets-what-your-company-needs-to-know-.html
5. www.unicef.org/end-violence/how-to-stop-cyberbullying

21MCC19	Marketing Management	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:
- 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:

21MCC19.CO1	:	Knowledge of basic understanding in solving marketing related problems.
21MCC19.CO2	:	Awareness of marketing management process, strategies and the marketing mix elements.
21MCC19.CO3	:	Clear understanding of functional area of marketing.
21MCC19.CO4	:	Demonstrating conceptual knowledge and analytical skills in analyzing the marketing environment.
21MCC19.CO5	:	Develop skills in recent trends in global marketing.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC19.CO1	X	X	X	-	-	-	-	X	-	X	-	X	X	-	-
21MCC19.CO2	X	X	X	-	-	X	X	X	X	X	-	X	X	-	-
21MCC19.CO3	X	X	X	-	-	X	X	X	X	X	-	X	X	-	-
21MCC19.CO4	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC19.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 ModernComponents 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: 45 Periods

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 Kortler and Kevin Lane Keller	Marketing Management	PHI 15th Edition	2015
3.	S.H.H. Kazmi	Marketing Management	Excel Books India, 2ndEdition	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	C. B Gupta & N Rajan Nair	Marketing Management text and Case	17th Edition	2016
2.	KS Chandrasekar	Marketing management-Text and Cases	Tata McGraw Hill, First edition	2010
3.	V S Ramaswamy& S Namkumari	Marketing management Global Perspective, Indian Context	Macmillan Publishers India, 5th Edition	2015

WEB URLs:

1. https://onlinecourses.swayam2.ac.in/cec20_mg06/preview
2. https://www.feedough.com/marketing-environment/
3. https://theintactone.com/2018/12/21/mm-u3-topic-3-differences-between-consumer-and-business-buyer behaviour/
4. https://www.yieldify.com/blog/stp-marketing-model/
5. https://www.michaelpage.com/advice/management-advice/development-and-retention/5-recent-advancements-marketing

| 21MCC20 | Organizational Behavior | L T P C |
| | | 3 0 0 3 |

COURSE OBJECTIVES:
- 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:

21MCC20.CO1	:	Students will have a better understanding of human behavior in organization.
21MCC20.CO2	:	They will know the framework for managing individual and group performance.
21MCC20.CO3	:	Characteristics of attitudes and components of attitudes — A brief discussion
21MCC20.CO4	:	List the determinants of personality
21MCC20.CO5	:	List the characteristics of various leadership styles.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC20.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCC20.CO2	X	X	X	-	-	X	X	-	X	X	-	X	X	-	-
21MCC20.CO3	X	X	X	-	-	X	X	X	X	X	-	X	X	-	-
21MCC20.CO4	X	X	X	-	-	X		X	X	X	-	X	X	-	-
21MCC20.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 OtherDisciplines 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: 45 Periods

TEXT BOOKS:

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

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.	Ivancevich, Konopaske & Maheson,	Organizational Behaviour & Management	Tata McGraw Hill, 7th edition	2008
3.	Robert Kreitner and Angelo Kinicki	Organizational behaviour	Tata McGraw Hill, 10th Edition	2016

WEB URLs:

1. https://www.encyclopedia.com/social-sciences-and-law/economics-business-and-labor/businesses-and occupations/organizational-behavior
2. https://docs.oracle.com/database/121/HTMDB/concept_url.htm
3. https://www.futurelearn.com/info/courses/the-evolution-of-management/0/steps/90525
4. https://migration.trujay.com/help/find-url-microsoft-dynamics-365/
5. https://msmgf.org/files/msmgf/documents/Org_Dev/Organizational%20Change%20and%20Development.pdf

21MCC21	SOFTWARE TESTING AND QUALITY ASSURANCE	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCC21.CO1	:	Able to test the software by applying various testing techniques.
21MCC21.CO2	:	Able to debug the project and to test the entire computer based systems at all levels.
	:	Able to test the applications in the specialized environment using various automation tools.
21MCC21.CO3		
21MCC21.CO4	:	Able to evaluate the web applications using bug tracking tools.
21MCC21.CO5	:	Able to apply quality and reliability metrics to ensure the performance of the software

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC21.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCC21.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC21.CO3	X	X	X	X	X	X	X	-	X	X	X	X	X	-	-
21MCC21.CO4	X	X	X	X	X	X	X	-	X	X	X	X	X	-	-
21MCC21.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: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Adithya P. Mathur	Foundations of Software Testing – Fundamentals algorithms and techniques	Dorling Kindersley (India) Pvt. Ltd	2008
2.	Boris Beizer	Software Testing Techniques	Dream Tech Press	2009
3.	Dale H. 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.	Edward Kit	Software Testing in the Real World – Improving the Process	Pearson Education	1995
2.	Glenford J. Myers, Tom Badgett, Corey Sandler	The Art of Software Testing	3rd Edition, John Wiley & Sons Publication	2012
3.	Illene Burnstein	Practical Software Testing	Springer International Edition	2003
4.	Naresh Chauhan	Software Testing Principles and Practices	Oxford University Press	2010

WEB URLs:

1.https://www.youtube.com/watch?v=BBmA5Qp6Ghk
2.https://www.youtube.com/watch?v=T3q6QcCQZQg
3.http://studymaterial.unipune.ac.in:8080/jspui/bitstream/123456789/3660/1/TYB.Voc%20Softw
4.https://www.youtube.com/watch?v=SfqF0CD0Me4
5.https://www.youtube.com/watch?v=5_cTi5xBlYg

21MCC22	ADVANCES IN NETWORKING	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- To understand the theme underlying IPv6 Structure and addressing methods.
- To understand and analyze 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:

21MCC22.CO1 : Understand the fundamentals of IPv6 and IPv6 Protocols

21MCC22.CO2 : Analyze the need for separation of data and control plan

21MCC22.CO3 : Understand the functionality of NFV

21MCC22.CO4 : Be Conversant with the latest networks and its architecture

21MCC22.CO5 : Gain an in-depth coverage of various networking technologies

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC22.CO1	X	X	X	-	-	-	-	-	X	-	-	X	X	-	-
21MCC22.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC22.CO3	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC22.CO4	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
21MCC22.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: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rick Grazian	IPv6 Fundamentals: A Straightforward 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
3.	Paul Goransson, Chuck Black	Software Defined Networks: A Comprehensive Approach	Morgan Kaufmann Publisher	2014

WEB URLs:

1. www.tutorialspoint.com/ipv6/ipv6_address_types.htm
2. www.geeksforgeeks.org/internet-control-message-protocol-icmp/
3. www.ibm.com/docs/en/i/7.1?topic=concepts-ip-security-protocols
4. www.researchgate.net/figure/Distributed-control-plane-architecture-implemented-Unlike   the-distributed-control-plane_fig3_339889233
5. www.blueplanet.com/resources/What-is-NFV-prx.html

21MCC23	SOFTWARE COMPUTING TECHNIQUES	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- 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:

21MCC23.CO1 : Identify and describe soft computing techniques and their roles in building intelligent

21MCC23.CO2 : Recognize the feasibility of applying a soft computing methodology for a particular problem.

21MCC23.CO3 : Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.

21MCC23.CO4 : Apply genetic algorithms to optimization problems.

21MCC23.CO5 : Design neural networks to pattern classification and regression problems using soft computing approach.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC23.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
21MCC23.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
21MCC23.CO3	x	x	x	-	x	x	-	-	-	x	-	x	x	-	-
21MCC23.CO4	x	x	x	-	x	x	-	-	x	x	-	x	x	-	-
21MCC23.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: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S. Rajasekaran and 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. Sun and E. 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.	SimonHaykin.	Neural Networks	Prentice Hall, 2 nd Edition	1999
2.	Timothy Ross	Fuzzy Logic with Engineering Applications	Wiley Publications,4 thEdition	2016
3.	David E. Goldberg	Genetic Algorithms in Search, Optimization and Machine Learning	Pearson Education, First Edition	2008

WEB URLs:

1. https://www.techtarget.com/searchenterpriseai/definition/fuzzy-logic
2. https://www.analytixlabs.co.in/blog/fundamentals-of-neural-networks/
3. https://www.javatpoint.com/pytorch-backpropagation-process-in-deep-neural-network
4. https://towardsdatascience.com/funderstanding-competitive-neural-networks-f855bd7882e1
5. https://arxiv.org/pdf/1911.00490

21MCC24	DEEP LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:
- 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:

21MCC24.CO1 : Describe the fundamental concepts of Neural Networks

21MCC24.CO2 : Apply Convolution Neural Network techniques to solve problems in image

21MCC24.CO3 : Summarize the characteristics of deep Learning

21MCC24.CO4 : Comprehend the Optimization and Generalization in Deep Learning

21MCC24.CO5 : Interpret the concepts of Deep Reinforcement Learning to solve real world problems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC24.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCC24.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC24.CO3	X	X	X	-	X	-	-	-	X	X	-	X	X	-	-
21MCC24.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC24.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 Roburst Models,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 PolicyGradients- Q Learning and Deep Q Networks-Improving and Moving Beyond DQN

TOTAL: 45 Periods

TEXT BOOKS:

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

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, YoshuaBengio and Aaron Courville	Deep Learning	First editionMIT Press, London	2016

WEB URLs:

1. https://www.sas.com/en_in/insights/analytics/neural-networks.html
2. https://www.techtarget.com/searchenterpriseai/definition/convolutional-neural-network
3. https://www.bmc.com/blogs/deep-neural-network/
4. https://developers.google.com/machine-learning/crash-course/generalization/video-lecture
5. https://bernardmarr.com/what-is-deep-reinforcement-learning/

21MCC25	BIG DATA PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:
- 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 amount of data
- To know about NoSQL databases and management

COURSE OUTCOMES:

21MCC25.CO1 : Work with big data tools and its analysis techniques
21MCC25.CO2 : Analyze data by utilizing clustering and classification algorithms
21MCC25.CO3 : Learn and apply different mining algorithms and recommendation systems for large amount of data
21MCC25.CO4 : Perform analytics on data streams
21MCC25.CO5 : Learn NoSQL databases and management

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCC25.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
21MCC25.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC25.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC25.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
21MCC25.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 – 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 BasedRecommendation- 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: 45 Periods

TEXT BOOKS:

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

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bart Baesens	Analytics in a Big Data World: The Essential Guide to Data Science and its Applications	Wiley Publishers	2014
2.	DietmarJannach and Markus Zanker	Recommender Systems: An Introduction	Cambridge University Press	2010
3.	Kim H. Pries and Robert Dunnigan	Big Data Analytics: A Practical Guide for Managers	CRC Press	2015

WEB URLs:

1. https://www.oracle.com/big-data/free-eb
2. https://www.analyticsvidhya.com › resources-big-data
3. https://www.simplilearn.com › Resources › Big Data
4. https://www.ibm.com › Analytics › Hadoop
5. https://www.qubole.com › big-data-analytics

21MCD01	PROJECT WORK	L	T	P	C
		0	0	24	12

COURSE OBJECTIVES:

- 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:

21MCD01.CO1	Formulate a real-world problem, identify the requirement and develop the design solutions.
21MCD01.CO2	Express the technical ideas, strategies and methodologies.
21MCD01.CO3	Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
21MCD01.CO4	Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
21MCD01.CO5	Prepare report and present the oral demonstrations.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MCD01.CO1	X	X	-	X	-	X	-	X	X	-	X	X	X	X	-
21MCD01.CO2	X	X	X	X	-	-	-	-	X	-	X	X	X	X	-
21MCD01.CO3	X	X	X	X	X	X	-	-	X	-	X	X	X	X	X
21MCD01.CO4	X	X	X	X	X	X	-	-	X	-	X	X	X	X	X
21MCD01.CO5	-	-	-	-	-	-	-	-	X	X	X	X	-	-	-

TOTAL: 360 Periods