COURSE STRUCTURE

MCA I SEMESTER

S.No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MC1T01	BS&H	Business Communication	3	0	0	3
2	20MC1T02	BS&H	Mathematical and Statistical Foundations	3	0	0	3
3	20MC1T03	PC	Computer Organization	3	0	0	3
4	20MC1T04	PC	Data Structures Using C	3	0	0	3
5	20MC1T05	PC	Data Base Management Systems	3	0	0	3
6	20MC1L06	BS&H	Business Communication Lab	0	0	3	1.5
7	20MC1L07	PC	Data Structures Lab	0	0	3	1.5
8	20MC1L08	PC	Data Base Management Systems Lab	0	0	3	1.5
9	20MC1M09	MC	Project using Design Thinking	0	0	1	0.5
			Total			10	20

MCA II SEMESTER

S.No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MC2T01	PC	Operating Systems	3	0	0	3
2	20MC2T02	PC	Computer Networks	3	0	0	3
3	20MC2T03	PC	Object Oriented Programming	3	0	0	3
4	20MC2T04	PC	Software Engineering	3	0	0	3
5	20MC2T05/ 20MC2T06/ 20MC2T07	PE	**Elective-I** No SQL Databases/ Design and Analysis of Algorithms/ Mobile Application Development	3	0	0	3
6	20MC2L08	PC	Operating Systems Lab	0	0	3	1.5
7	20MC2L09	PC	Computer Networks Lab	0	0	3	1.5
8	20MC2L10	PC	Java Programming Lab	0	0	3	1.5
9	20MC2M11	MC	Python Programming (to be taken through MOOCs)	0	0	0	0.5
			Total	15	0	10	20

MCA III SEMESTER

S.No	Course Code	Course Category	Course Tile	L	T	P	Credits
1	20MC3T01	PC	Machine Learning with Python	3	0	0	3
2	20MC3T02	PC	Big Data Analytics	3	0	0	3
3	20MC3T03	PC	Web Technologies	3	0	0	3
4	20MC3T04	PC	Cryptography and Network Security	3	0	0	3
5	20MC3T05/ 20MC3T06/ 20MC3T07/ 20MC3T08	PE	**Elective-II** Software Project Management Cloud Computing Cyber Security Advanced Data Bases	3	0	0	3
6	20MC3L09	PC	Machine Learning with Python Lab	0	0	3	1.5
7	20MC3L10	PC	Big Data Analytics Lab	0	0	3	1.5
8	20MC3L11	PC	Web Technologies Lab	0	0	4	2
9	20MC2P12	PR	Internship / Industry Oriented Mini Project/ Skill Development Course (Minimum 6-weeks)	0	0	0	2
			Total	15	0	10	22

MCA IV SEMESTER

S.No	Course Code		Course Title	L	T	P	Credits
1	20MC4T01/ 20MC4T02/ 20MC4T03	PE	**Elective-III *** Digital Marketing/ Human Resource Management/ Ad-hoc and Sensor Networks/ MOOCs-1(NPTEL/SWAYAM) Full Stack Technologies Any Recommended Course	3	0	0	3
2	20MC4T04/ 20MC4T05/ 20MC4T06 20MC4T07	PE	Elective-IV * Block Chain Technologies/ Software Testing Methodologies/ E Commerce MOOCs-2(NPTEL/SWAYAM) -Data Science -Any Recommended Course	3	0	0	3
3	20MC4P08	PR	Project Work/ Dissertation	0	0	0	12
			Total	6	0	0	18

*Students going for Industrial Project/Thesis will complete these courses through MOOCs (even in earlier semester)

MCA I Semester

L	T	P	C
3	0	0	3

20MC1T01 BUSINESS COMMUNICATION

Course Objectives:

To acquaint the students with fundamentals of communication, help them honing oral, written and non- verbal communication skills and to transform them as effective communicators.

Course Outcomes:

• Understand various components of communication skills besides listening skills.
• Learn nuances of organizational communication, Interpersonal and Intra Personal communication
• Demonstrate the Non Verbal communication strategies for effective usage during interview process
• Demonstrate writing skills
• Use presentation skills in real time environments

SYLLABUS

UNIT I:

Purpose and process of communication: Objectives of Communication-Process of Communication - Types of communication; noise, listening skills, Types of listening, essentials of good listening and tips.

UNIT II:

Managing Organizational Communication: Formal and Informal Communication- Interpersonal and Intrapersonal communication- Role of Emotion in Interpersonal Communication- Barriers to Interpersonal Communication- Exchange Theory- Gateways for Effective Interpersonal Communication.

UNIT III:

Non-verbal communication and Body Language: Kinesics, Proxemics, Paralanguage, Haptics, handshakes, appropriate body language and mannerisms for interviews: business etiquettes- across different cultures.

UNIT IV:

Written communication: mechanics of writing, report writing- business correspondence- business letter format- Meetings and managing meetings- Resume writing- Formats and Skills.

UNIT V:

Presentation skills: prerequisites of effective presentation, format of presentation; Assertiveness – strategies of assertive behavior; Communication skills for group discussion and interviews, Interview Techniques.

Note: Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Reference Books:

1) Mallika Nawal: "Business Communication", Cengage Learning, New Delhi, 2012.

2) Edwin A. Gerloff, Jerry C. Wofford, Robert Cummins Organisational Communication: The key stone to managerial effectiveness.

3) Meenakshi Rama: "*Business Communication*", Oxford University Press, New Delhi

4) C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai

5) Paul Turner: "*Organisational Communication*", JAICO Publishing House, New Delhi.

6) Sathya Swaroop Debasish, Bhagaban Das" "*Business Communication*", PHI Private Limited, New Delhi, 2009.

7) R.K.Madhukar: "Business Communication", Vikas Publishing House, New Delhi, 2012.

8) Kelly M Quintanilla, Shawn T. Wahl:"Business and Professional Communication", SAGE, New Delhi, 2012.

9) Sangita Mehta, Neety Kaushish: "Business Communication", University Science Press, New Delhi, 2010.

10) Anjali Ghanekar:"Business Communication Skills", Everest Publishing House, New Delhi, 2011

	L	T	P	C
MCA I SEMESTER	3	0	0	3

20MC1T02 MATHEMATICAL AND STATISTICAL FOUNDATIONS

Course Objectives: This course is aimed at enabling the students to

- Understand the mathematical fundamentals that is prerequisites for variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems bio informatics, Machine learning.
- Develop the understanding of the mathematical and logical basis to many modern techniques in computer science technology like machine learning, programming language design, and concurrency.
- Study various sampling and classification problems.

Course Outcomes:

- Apply the basic rules and theorems of probability theory.
- Analyze sampling, means, proportions, variances and estimate the maximum likelihood based on population parameters.
- Formulate sample means, variances and proportions and draw conclusions based on the results of statistical tests.
- Design various ciphers using number theory.
- Apply graph theory for real time problems like network routing problem.

UNIT I:

Basic Probability and Random Variables: Random Experiments, Sample Spaces Events, the Concept of Probability the Axioms of Probability, Some Important Theorems on Probability Assignment of Probabilities, Conditional Probability Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule. Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables

UNIT II:

Sampling and Estimation Theory: Population and Sample, Statistical Inference Sampling With and Without Replacement Random Samples, Random Numbers Population Parameters Sample Statistics Sampling Distributions, The Sample mean, sampling distribution of means, sampling distribution of Proportions.. Unbiased Estimates and Efficient Estimates Point Estimates and Interval Estimates.

UNIT III:

Tests of Hypothesis and Significance: Statistical Decisions Statistical Hypotheses. Null Hypotheses, Tests of Hypotheses and Significance Type I and Type II Errors Level of Significance Tests Involving the Normal Distribution One-Tailed and Two-Tailed Tests, P Value, Special Tests of Significance for Large Samples, Special Tests of Significance for Small Samples.

UNIT IV:

Algebraic Structures and Number Theory: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

UNIT V:

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Coloring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

Reference Books:

1) Foundation Mathematics for Computer Science, 1st Edition, John Vince,Springer,2015

2) Probability & Statistics, 3rd Edition, Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers,2018

3) Probability and Statistics with Reliability,2nd Edition, K. Trivedi, Wiley,2011

4) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, H. Rosen, Tata McGraw Hill, 2003

5) Probability and Computing: Randomized Algorithms and Probabilistic Analysis,1st Edition, M. Mitzenmacher and E.Upfal,2005

6) Applied Combinatorics, 6thEdition, Alan Tucker,Wiley,2012

	L	**T**	**P**	**C**
MCA I SEMESTER	3	1	0	4

20MC1T03 COMPUTER ORGANIZATION

Course Objectives:

The purpose of the course is to introduce principles of computer organization and the basic architectural concepts. In depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems.

Course Outcomes:

- Understand the design of the functional units of a digital computer system.
- Recognize and manipulate representations of numbers stored in digital computers
- Understand the Design of combinational and sequential circuits
- Understand the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components
- Solve elementary problems by assembly language programming

UNIT I:

Digital Components and Data Representation: Introduction, Numbering Systems, Decimal to inary Conversion, Binary Coded Decimal Numbers, Weighted Codes, Self-Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCII Code

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

UNIT II:

Combinational Circuits: Boolean expressions and their minimization using algebraic identities; Karnaugh map representation and minimization of Boolean functions using K- map; Two-level realizations using gates -- AND-OR, OR-AND, NAND-NAND and NOR- NOR structures.

Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Integrated NAND-NOR Gates, Multifunction gates, Multi-bit adder, Multiplexers, De-multiplexers, Decoders

UNIT III:

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT IV:

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Reference Books:

1. Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson Education.

2. Computer System Architecture, 3^{rd}ed., M.Morris Mano,PHI

3. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI,2006

4. Computer Organization, 5^{th}ed., Hamacher, Vranesic andZaky,TMH,2002

5. Computer Organization & Architecture: Designing for Performance, 7^{th}ed., William Stallings, PHI,2006

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	L	T	P	C
MCA I SEMESTER	3	0	0	3

20MC1T04 DATA STRUCTURES USING C

Course Objectives:

The objective of this course is to explore basic data structures such as stacks and queues, introduce a variety of data structures such as hash tables, search trees, tries, heaps, graphs, sorting and pattern matching algorithms.

Course Outcomes

• Implement basic programs by using C concepts.
• Understand the concepts of pointers and file handling concepts in C.
• Apply data structures that efficiently model the information in a problem
• Assess efficiency trade-offs among different data structure implementations or combinations
• Implement and know the application of algorithms for sorting and pattern matching.

UNIT I:

Introduction to C: Constants and variables, Operators and Expressions, Managing Input and Output operators, Decision making-branching and looping, Arrays,

UNIT II:

Functions, Structures and Unions, Pointers, File handling in C.

UNIT III:

Data structure: Definition, types of data structures Recursion Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion. Preliminaries of algorithms, analysis and complexity .**Linear list** – singly linked list, Double linked list and circular linked list - implementation, insertion, deletion and searching operations on linear list.

UNIT IV:

Stacks-Operations, array and linked representations of stacks, stack applications, **Queues**-operations, array and linked representations. **Hash Table Representation:** hash functions, collision resolution- separate chaining, open addressing-linear probing, quadratic probing, double hashing and rehashing, extendible hashing.

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UNIT V:

Sorting Techniques: Insertion sort, selection sort, exchange-bubble sort, quick sort and merge sort Algorithms. **Trees:** Binary Trees, terminology, representation and traversals- pre, post & in order traversals. **Search Trees:** Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion

Reference Books:

1) Data Structures and Algorithm Analysis in C, 2nd ed, Mark AllenWeiss
2) Data Structures: A Pseudo code Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.
3) Let Us C: Authentic Guide to C Programming Language,17th ed., Yashavant Kanetkar, BPB Publications.
4) Data Structures Using C. 2nd Edition, Reema Thareja, Oxford
5) Programming in ANSI C, 5thed, E. Balaguru swamy, TMH

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	L	T	P	C
MCA I SEMESTER	3	0	0	3

20MC1T05 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

To enable students to understand and use relational Database system. Conceptual design using ERD, functional dependencies and Normalization and relational algebra are covered in detail. Students learn how to design and create a good database and use various SQL operations.

Course Outcomes:

1. Understand database and different database models
2. Design Entity Relationship models and convert to relational Model
3. Design and implement queries using Structured Query Language
4. Design database schema and apply normalization.
5. Understand and apply transaction management and Concurrency control.

UNIT I:

Introduction to Databases: Introduction, An Example, Characteristics of the Database Approach, Actors on Scene, Workers behind the scene, Advantages of Using the DBMS Approach, brief History of Database Applications, When Not to Use a DBMS

Overview of Database Languages and Architectures: Data Models, Schemas and Instances, Three- Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architecture for DBMSs, Classification of Database Management Systems

UNIT II:

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model, Conceptual Design for Large Enterprises

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/Altering Tables and Views

UNIT III:

Relational Algebra: Selection and Projection, Set Operations, Renaming, Joins,

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Division, More Examples of Algebra Queries.

SQL: Queries, Constraints, Triggers: The Form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases.

UNIT IV:

Introduction to Normalization Using Functional and Multivalued Dependencies: Informal Design Guidelines for Relation Schema, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multi valued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

UNIT V:

Transaction Management and Concurrency Control: Transaction Concept, A Simple Transaction Model, Storage Structure, ACID Properties, Serializability, Transaction Isolation Levels, Concurrency Control, Lock-Based Protocols, Validation-Based Protocols **[Text Book-2]**

Note: For Practical Examples Please Go Through Reference 1

Reference Books:

1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, McGraw-Hill

2) Database System Concepts, 6/e, Abraham Silberschatz,Henry F.Korth, S.Sudarshan, McGraw- Hill

3) Database Systems, 6/e Ramez Elmasri, Shamkant B. Navathe, Pearson

4) Database Systems, 9/e, Carlos Coronel, Steven Morris, Peter Rob, Cengage

5) Introduction to Database Systems, 8/e, C J Date, Pearson

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	L	**T**	**P**	**C**
MCA I SEMESTER	0	0	3	1.5

20MC1L06 BUSINES COMMUNICATION LAB

Course Objectives:

To acquaint the students with fundamentals of communication, help them honing oral, written and non- verbal communication skills and to transform them as effective communicators.

Course Outcomes:

• Understand various components of communication skills besides listening skills.
• Learn nuances of organizational communication, Interpersonal and Intra Personal communication
• Demonstrate the Non Verbal communication strategies for effective usage during interview process
• Demonstrate writing skills
• Use presentation skills in real time environments

Task 1:

• Role plays

Task 2:

• JAM

Task 3:

• Group Discussion

Task 4:

• Debate

Task 5:

• Presentation Skills

Task 6:

• Interview Process

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L	T	P	C
0	0	3	1.5

MCA I SEMESTER

20MC1L07 DATA STRUCTURES LAB

Course Objectives: This Course will enable students to

• Design and implement various data structures.

• Implement operations like searching, insertion, and deletion, traversing mechanism

• Develop applications using data structure algorithms.

Course Outcomes (COs):

• Implement various basic data structures and its operations.

• Apply sorting and searching algorithms to given numbers

• Implement various tree operations.

• Implement various graphs algorithms.

• Develop applications using various data structures.

Experiment 1:

a) Write a program in C to display the n terms of even natural number and their sum.

b) Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 +1/4 + 1/5 ... 1/n terms.

c) Write a C program to check whether a given number is an Armstrong number or not.

d) Write a C program to calculate the factorial of a given number.

Experiment 2:

a) Write a program in C for multiplication of two square Matrices.

b) Write a program in C to find transpose of a given matrix.

Experiment 3:

a) Write a program in C to check whether a number is a prime number or not using the function.

b) Write recursive program which computes the nth Fibonacci number, for appropriate values of n.

c) Write a program in C to add numbers using call by reference.

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Experiment 4:

a) Write a program in C to append multiple lines at the end of a text file.

b) Write a program in C to copy a file in another name.

Experiment 5:

Write recursive program for the following

a) Write recursive and non recursive C program for calculation of Factorial of an integer.

b) Write recursive and non recursive C program for calculation of GCD (n, m)

c) Write recursive and non recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

Experiment 6:

a) Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Experiment 7:

a) Write C program that implement stack (its operations) using arrays.

b) Write C program that implement stack (its operations) using Linked list.

Experiment 8:

a) Write a C program that uses Stack operations to convert infix expression into postfix expression.

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists.

Experiment 9:

Write a C program that uses functions to create a singly linked list and perform various operations on it.

Experiment 10:

Write a C program to store a polynomial expression in memory using linked list and perform polynomial addition.

Experiment 11:

a) Write a recursive C program for traversing a binary tree in preorder, in order and post order.

b) Write an on recursive C program for traversing abinary tree in preorder, in order and post order.

Experiment 12:

a) Write a C program to implement Prims' algorithm.

b) Write a C program to implement Kruskal's algorithm.

Experiment 13:

Implementation of Hash table using double hashing as collision resolution function.

Experiment 14:

Implementation of Binary Search trees- Insertion and deletion.

Experiment 15:

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order.

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order.

c) Write C program that implement merge sort, to sort a given list of integers in ascending order

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	L	T	P	C
MCA I SEMESTER	0	0	3	1.5

20MC1L08 DATA BASE MANAGEMENT SYSTEMS LAB

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:

- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Experiments:

1) Execute all DDL, DML and DCL commands on sample tables.
2) Implementation of different types of operators and built-in functions with suitable examples
3) Implementation of different types of joins with suitable examples
4) Create views, partitions, Sequence, Indexes and locks for a particular DB
5) Implement different types of constraints on relations.
6) Implementation of sub queries and nested queries.
7) Implement Queries on Group By & Having Clauses, ALIAS, Sequence By, Order By
8) Control Structure
   a) Write a PL/SQL block for Addition of Two Numbers
   b) Write a PL/SQL block for IF, IF and else condition
   c) Write a PL/SQL block for implementation of loops
   d) Write a PL/SQL block for greatest of three numbers using IF and ELSEIF
9) Exception Handling- Implement the following with respect to exception handling. Raising Exceptions, User Defined Exceptions, Pre-Defined Exceptions
10) Write PL/SQL block for an application using exception handling *Procedures*

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a) Write a PL/SQL Procedure using Positional Parameters

b) Write a PL/SQL Procedure using notational parameters

c) Write a PL/SQL Procedure for GCD Numbers

d) Write a PL/SQL Procedures for cursor implementation (explicit and implicit cursors)

11) Functions:

a) Write a PL/SQL block to implement factorial using functions

b) Write a PL/SQL function to search an address from the given database

12) WriteaDBMSprogramtopreparePl/SQLreportsforanapplicationusingfunctions.

13) Triggers:

a) Write a Trigger to pop-up the DML operations

b) Write a Trigger to check the age valid or not Using Message Alert.

c) Create a Trigger to Raise appropriate error code and error message.

d) Create a Trigger on a table so that it will update another table while inserting values

14) Write PL/SQL block for an application using cursors and all types of triggers.

15) Write a PL/SQL block for transaction operations of a typical application using package

Text Books:

1) Oracle: The Complete Reference by Oracle Press

2) Nilesh Shah, "Database Systems Using Oracle", PHI,2007

3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education,2007

L	T	P	C
0	0	1	0.5

MCA I SEMESTER

20MC1M09 PROJECT USING DESIGN THINKING

Course Objectives:

• Build mindsets & foundations essential for designers

• Learn about the Human-Centered Design methodology and understand their real-world applications

• Use Design Thinking for problem solving methodology for investigating ill defined problems.

• Undergo several design challenges and work towards the final design challenge

Apply Design Thinking on the following Streams to

• Project Stream1: Electronics, Robotics, IOT and Sensors

• Project Stream2: Computer Science and IT Applications

• Project Stream 3: Mechanical and Electrical tools

• Project Stream 4: Eco-friendly solutions for waste management, infrastructure, safety, lternative energy sources, Agriculture, Environmental science and other fields of engineering.

How to Pursue the Project Work?

• The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.

• The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human-centered design.

• The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.

• The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.

• Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc

• At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

Tasks to be done:

Task 1: Everyone is a Designer

• Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast

• Gain a quick introduction to the design thinking methodology

• Go through all stages of the methodology through a simple design challenge

• Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3: Teams & Problems

• Start Design Challenge and learn about teams & problems through this

• Foster team collaboration, find inspiration from the environment and learn how to identify problems

Task 4: Empathizing

• Continue Design Challenge and learn empathy

• Learn techniques on how to empathize with users

• Go to the field and interview people in their environments

• Submit Activity Card

Task 5: Ideating

• Continue Design Challenge and learn how to brain storm effectively

• Encourage exploration and foster spaces for brainstorming

• Submit Activity Card

Task 6: Prototyping

• Continue Design Challenge and learn how to create effective prototypes

• Build tangible models and use them as communication tools

• Start giving constructive feedback to classmates and teammates

• Submit Activity Card

Task 7: Testing

• Finish Design Challenge and iterate prototypes and ideas through user feedback

• Evolve ideas and prototypes through user feedback and constructive criticism

• Get peer feedback on individual and group performance

• Submit Activity Card

Task 8 :

• Final Report Submission and Presentation

References:

1. Tom Kelly, The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm (Profile Books,2002)

2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (HarperBusiness,2009)

3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good: Innovation in the Social Sector (Columbia Business School Publishing,2017)

Other Useful Design Thinking Frameworks and Methodologies:

▪ Human-Centered Design Toolkit (IDEO);https://www.ideo.com/post/design-kit

▪ Design Thinking Boot Camp Bootleg (Stanford D-School);https://dschool.stanford.edu/resources/the-bootcamp-bootleg

▪ Collective Action Toolkit (frog design) ;
https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf

▪ Design Thinking for Educators (IDEO);https://designthinkingforeducators.com/

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L	T	P	C
3	0	0	3

MCA II SEMESTER

20MC2T01 OPERATING SYSTEMS

Course Objectives:

This Course will enable students to implement CPU scheduling algorithms, Disk scheduling algorithms

COURSE OUTCOMES:

• Understand the functionalities of an operating system and Evaluate different CPU scheduling algorithms.

• Apply synchronization to cooperating processes and handle the deadlocks

• Learn various management techniques for efficient utilization of system memory.

• Understand and analyze theory and implementation offiles and Evaluate different disk scheduling algorithms.

• Analyze the functionalities in various operating systems.

SYLLABUS:

UNIT I

Introduction to Operating System Concept: Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types.

Process Management– Process concept, the process, Process State Diagram, Process control block, Process

Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Inter process Communication, Scheduling- Basic Concepts, Scheduling Criteria, and Scheduling Algorithms.

UNIT-II:

Concurrency: Process Synchronization, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization examples

Principles of deadlock– System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock

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UNIT-III:

Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation

Virtual Memory Management: Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing

UNIT-IV:

File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation- File system structure, allocation methods, free-space management

UNIT V:

Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers.

Linux System: Components of LINUX, Inter process Communication, Synchronization, Interrupt,

Exception and System Call.

REFERENCES:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.

2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.

3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016.

4. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.

5. Operating Systems: A Concept- Based Approach, D M Dhamdhere, Second Edition, Tata Mc Graw- Hill Education, 2007.

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MCA II SEMESTER	3	0	0	3

20MC2T02 COMPUTER NETWORKS

Course Objectives:

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

- Understands the fundamental concepts of computer networking and OSI Reference model.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Learn and understand the advanced networking concepts, preparing the student for entry advanced courses in computer networking.
- Develop and gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcomes (COs): At the end of the course, student will be able to

- Understand the network architecture, TCP/IP and OSI reference models
- Demonstrate the data link protocols, multi-channel access protocols and IEEE 802 standards for LAN
- Describe routing and congestion in network layer with routing algorithms and classify IPV 4 addressing scheme
- Understand the elements and protocols of transport layer
- Understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

UNITI:

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models.

Physical Layer –Introduction to physical layer-Data and Signals, Periodic analog signals, digital signals, transmission impairment, Data rate limits, performance - Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and Unguided media: Wireless- Radio waves, microwaves, infrared.

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UNIT II:

The Data Link Layer - Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction– Error- Correcting Codes– Error Detecting Codes. **Elementary Data Link Protocols-** A Utopian Simplex Protocol-A Simplex Stop and Wait Protocol for an Error free channel-A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols- A One Bit Sliding Window Protocol –A Protocol Using Go –Back –N - A Protocol Using Selective Repeat.

UNIT III:

The Medium Access Control Sub layer-The Channel Allocation Problem-Static Channel Allocation- Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha-Pure aloha- slotted aloha-Carrier Sense Multiple Access Protocols-Collision-Free Protocols-Limited Contention Protocols. **Wireless LAN Protocols-** Ethernet-Classic Ethernet Physical Layer-Classic Ethernet MAC Sub-layer Protocol-Ethernet Performance-Fast Ethernet- Wireless LANs-The 802.11 Architecture and Protocol Stack.

UNIT IV:

The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service- Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical. **Congestion Control algorithms-** General principles of congestion control, Congestion prevention polices, **Internet Working:** How networks differ- How networks can be connected- Tunneling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-, IP addresses-, Subnets-IP Version 6-The main IPV6 header-Internet control protocols- ICMP-ARP- DHCP.

UNIT V:

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services- TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control. **Application Layer–**-World Wide Web: HTTP, FTP- Two connections-control connection- Data connection - security of FTP-Electronic mail - Architecture- web based mail- email security-

TELENET-local versus remote Logging. **Domain Name System:** Name Space, DNS in Internet, - Resolution-Caching- Resource Records- DNS messages- Registrars-security of DNS Name Servers.

Reference Books:

1) Computer Networks: Andrew S Tanenbaum David J. Wetherall, 5/e, Pearson

2) Data communications andnetworking:BehrouzForouzan,5/e, McGraw Hill

3) Computer Networks –A System Approach, Peterson, Bruce Davie, 2/e, Harcourt Asia

4) Compute communications and networking technologies, Gallo, Hancock, Cengage

5) An Engineering approach to compute networking, Kesha, Pearson

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MCA II SEMESTER	3	0	0	3

20MC2T03 OBJECT ORIENTED PROGRAMMING

Course Objectives:

- To understand the basic concepts of object oriented programming concepts.
- To introduce the principles of inheritance and polymorphism and demonstrate how they are related to the design of abstract classes
- To understand the implementation of packages and interfaces
- To introduce the concept of multithreading and exception handling
- To learn and understand the design of Graphical User Interface using applets and swing controls

Course Outcomes (COs): At the end of the course, student will be able to

- Understand the OOP concepts
- Apply OOP concepts to solve real world problems
- Demonstrate the exception handing, multithread applications with synchronization
- Design the GUI based applications using AWT and Swings
- Apply the Collection Frame work

UNIT I:

Basics of Object Oriented Programming (OOP): Need for OO paradigm , A way of viewing world- Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, summary of OOP concepts, coping with complexity, abstraction mechanisms.

Java Basics: Data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects- concepts of classes, objects, constructors methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling.

UNIT II:

Inheritance: Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism, abstract classes.

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Packages and Interfaces: Defining, Creating and Accessing a package, Understanding CLASSPATH, Importing packages, differences between classes and interfaces, defining an interface, Implementing interface, applying interfaces variables in interface and extending interfaces.

UNIT III:

Exception handling and Multithreading: Concepts of exception handling, benefits of exception handling, Termination or presumptive models, exception hierarchy, usage of try, catch, throws and finally, built – in exceptions, creating own exception sub-classes. Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

UNIT IV:

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy , user- interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, list panes- scroll pane, dialogs, menu bar, graphics, layout manager- layout manager types- boarder, grid, flow, card and grid bag.

UNIT V:

Applets: Concepts of Applets, differences between applets and applications, life cycle of an apple, types of applets, creating applets, passing parameters to applets, **Swings:** Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons -The J Button class, Check boxes, Radio Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees and Tables.

Reference Books:

1) Java-The complete reference,7/e, Herbert Schildt, TMH
2) JAVA: How to program, 8/e, Dietal, Dietal, PHI
3) Introduction of programming with JAVA, S. Dean, TMH
4) Introduction to Java programming, 6/e, Y. Daniel Liang, Pearson
6) Big Java2, 3/e, Cay. S. Horstmann, Wiley

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MCA II SEMESTER	3	0	0	3

20MC2T04 Software Engineering

COURSE OBJECTIVES:

1) To grasp generic models to structure the software development process.

2) To understand core concepts of requirements engineering and requirements specification.

3) To recognize different notion of complexity at both the module and system level.

4) To be aware of some widely known design methods.

5) To understand the role and contents of testing activities in different life cycle phases.

COURSE OUTCOMES:

1) Understand the perspective of various software process models

2) Understand the Requirements Engineering Process and compile an SRS

3) Analyze the requirements and perform a Design

4) Apply testing principles on software project and understand the maintenance concepts.

5) Identify risks; manage the change to assure quality in software projects

SYLLABUS

UNIT-I

The Evolving Role of Software – Software – The changing Nature of Software – Legacy software — A

generic view of process– A layered Technology – A Process Framework – The Capability Maturity Model Integration (CMMI) – Process Assessment –Personal and Team Process Models – Product and Process – Process Models – The Waterfall Model – Incremental Process Models – Incremental Model – The RAD Model – Evolutionary Process Models – Prototyping – The Spiral Model – The Concurrent Development Model – Specialized Process Models – The Unified Process.

UNIT-II

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Designing the architecture. Assessment: Impact of Requirement Engineering in their problem. Decision Tables, SRS Document, IEEE Standards for SRS, Design: Architectural design, component level design, user interface design.

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UNIT-III

Requirements Analysis – Analysis Modeling Approaches: Design Engineering – Design Process –Design Quality - Design Model - User Interface Design Design: Modeling with UML, Use case Diagrams, Class Diagrams, Object Diagrams, Sequence Diagrams, Collaboration Diagrams, Component Diagrams, Deployment Diagrams Coding standards, Coding Guidelines, Modern Programming Language features, Documentation Guidelines

UNIT-IV

Implementation and Testing: Quality concepts, Review techniques, Software Quality Assurance (SQA):

Verification and Validation, SQA Plans, Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom- Up Testing, Software Testing Strategies - Strategies: Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Testing conventional applications, Testing object oriented applications, and Testing Web applications.

UNIT-V

Project Management Concepts, Process and Project Metrics, Estimation for Software projects, Software Cost Estimation, Project Scheduling, Risk Management, Maintenance and Reengineering. Assessment: Preparation of Risk mitigation plan.

REFERENCES:

1. "Fundamentals of Software Engineering", Rajib Mall, PHI Publication, 3rdedition.(Units 1,2,5)

2. Software Engineering, A Precise approach, Pankaj Jalote, Wiley.(Units 3,4)

3. Software Engineering, concepts and practices, Ugrasen Suman, Cengage learning(Units 3,5)

4. Roger S. Pressman, ―Software Engineering: A Practitioner's Approach‖, McGraw Hill International edition, Seventh edition.

6. Stephan Schach, ―Software Engineering‖, Tata McGraw Hill.

7. Ian Sommerville, Software Engineering, 9th Edition, Pearson Publishers.

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MCA II SEMESTER	3	0	0	3

20MC2T05 No SQL DATABASES

Course Objectives:

The objective of the course is to:

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column oriented and Graph)
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases
- Explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases
- Ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes:

After the completion of the course, student will be able to do the following

- Identify the type of NoSQL database to implement based on business requirements (key-value, document, full text, graph,etc.)
- Apply NoSQL data modeling from application specific queries
- Understand NoSQL Storage Architecture
- Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing
- Apply indexing and ordering of data sets

UNIT I:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

UNIT II:

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

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UNIT III:

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

UNIT IV:

NoSQL Stores: Similarities Between Sql And Mongodb Query Features, Accessing Data From Column-Oriented Databases Like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution In Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

UNIT V

Indexing and Ordering Data Sets : Essential Concepts Behind A Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Reference Books:

1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional,2012.
2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications,2013.
3) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN:978-0-470-94224-6
4) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

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MCA II SEMESTER

20MC2T06 DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

- To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes:

- Describe asymptotic notation used for denoting performance of algorithms
- Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non- recursive algorithms
- Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches
- Apply graph search algorithms to real world problems
- Demonstrate an understanding of NP- Completeness theory and lower bound theory

UNIT I:

Introduction: Algorithm, Pseudo code for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, probabilistic analysis, Amortized analysis. Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected components and bi- connected components.

UNIT II:

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Stassen's matrix multiplication. Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III:

Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

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UNIT IV:

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT V:

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branchand Bound solution, FIFO Branch and Bound solution. NP- Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP Complete classes, Cook's theorem.

Reference Books:

1) Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press

2) The Algorithm Design Manual, 2nd edition, Steven S. Skiena, Springer

3) Introduction to Algorithms, second edition, T.H. Cormen, C.E. Leiserson, R.L. Rivestand C. Stein, PHI Pvt. Ltd

4) Introduction to the Design and Analysis of Algorithms, An any Levi tin, PEA

5) Design and Analysis of Algorithms, Pearson Education, Parag Himanshu Dave, Himansu Bala

   chandra Dave

6) Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T. Lee, S.S.Tseng, R.C. Chang and T. Tsai, McGraw Hill.

7) Design and Analysis of algorithms, Pears on education, Aho, Ullman and Hopcroft

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MCA II SEMESTER	3	0	0	3

MOBILE APPLICATION DEVELOPMENT (20MC2T07)

Course Objectives:

- To demonstrate the introduction and characteristics of mobile applications
- Frame works. Managing application data and User- interface design for mobile applications
- Integrating networking, the OS and hardware into mobile-applications
- Addressing enterprise requirements in mobile applications – performance, scalability, modifiability, availability and security
- Testing methodologies for mobile applications– Publishing, deployment, maintenance and management. To demonstrate their skills of using Android software development tools
- To demonstrate their ability to deploy software to mobile devices

Course Outcomes:

- Install and configure Android application development tools
- Design and develop user Interfaces for the Android platform
- Understand the aspects of state information across important operating system events
- Apply Java programming concepts to Android application development
- Understand Testing methodologies for mobile applications

UNIT I:

Introduction to mobile devices: Introduction to Mobile Computing, Introduction to Android Development Environment, Mobile devices vs. desktop devices, ARM and Intel architectures, Screen resolution, Touch interfaces, Application deployment, App Store, Google Play, Windows Store.

Development environments: XCode, Eclipse, VS2012, PhoneGAP, etc.; Native vs. web applications. **Factors in Developing Mobile Applications:** Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User.

UNIT II:

Android User Interface: Measurements – Device and pixel density independent measuring units User Interface(UI)Components– Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding

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fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

UNIT III:

Back Ground Running Process, Networking and Telephony Services: Services: Introduction to services local service, remote service and binding the service, the communication between service and activity, Intent Service.

Multi Threading: Handlers, Async Task.

Broad cast receivers: Local Broadcast Manager, Dynamic broadcast receiver, System Broadcast. Pending Intent, Notifications.

UNIT IV:

Android: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

Android network programming: Http URL Connection, Connecting to REST -based and SOAP based Web services.

UNIT V:

Advanced Topics: Power Management: Wake locks and assertions, Low-level OS support, Writing power-smart applications.

Augmented Reality via GPS and other sensors: GPS, Accelerometer, Camera.

Mobile device security in depth: Mobile malware, Device protections, iOS "Jailbreaking", Android "rooting" and Windows' "defenestration"; Security and Hacking: Active Transactions, More on Security, Hacking Android.

Reference Books:

1) Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 2nd edition, 2015.

2) Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) ,2012

3) Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

4) Dawn Griffiths, David Griffiths,*"Head First: Android Development" ,OReilly2015,ISBN*:

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9781449362188

5) Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012

6) Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox),2013

7) Tomasz Nurkiewicz and Ben Christensen, Reactive Programming with RxJava, O'Reilly

  Media, 2016.

8) Brian Fling, Mobile Design and Development, O'Reilly Media, Inc., 2009.

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MCA II SEMESTER	**0**	**0**	**3**	**1.5**

20MC2L08 OPERATING SYSTEMS LAB

Course Objectives:

This Course will enable students to implement CPU scheduling algorithms, Disk scheduling algorithms, Execute different types of Linux commands and Write shell scripts

Course Outcomes (COs): At the end of the course, student will be able to

- Implement various CPU scheduling algorithms and compare results
- Implement various disk scheduling algorithms and compare results
- Implement page replace algorithms
- Implement various memory management techniques.
- Execute basic Linux commands

List of Experiments:

UNIX Lab- Introduction to UNIX

1. Study of Unix/Linux general purpose utility commands
2. Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
3. Study of UNIX/LINUX File System (tree structure).
4. C program to emulate the UNIX ls –lcommand
5. C program that illustrates how to execute two commands concurrently with a command pipe. Ex: -ls –l | sort
6. Multi programming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls

Operating Systems Lab

1. Simulate the Following CPU Scheduling Algorithms
   A) FCFS   B) SJF   C) Priority   D) Round Robin
2. Multiprogramming-Memory Management-Implementation of fork(),wait(), exec() and exit()
3. Write a program to implement first fit, best fit and worst fit algorithm for memory management.

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4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate Bankers Algorithm for Dead Lock Prevention.
6. Simulate The Following Page Replacement Algorithms.
   a) FIFO   b)LRU   c)LFU
7. Simulate the Following File Allocation Strategies
   A) Sequenced   b) Indexed   c)Linked

Linux Lab

1. Write a Shell program to check whether given number is prime or not.
2. Write a shell script which will display Fibonacci series up to the given range.
3. Write a shell script to check whether the given number is Armstrong or not.
4. Write a shell script to the calculate the value of
5. Write a shell script to accept student number, name, marks in 5subjects.
6. Find total, average and grade using the following rules: Avg>=80 then grade A Avg<80&&Avg>=70 then gradeB Avg<70&&Avg>=60 then gradeC Avg<60&&Avg>=50 then gradeD Avg<50&&Avg>=40 then gradeE
7. Write a shell script to find minimum and maximum elements in the given list of elements.
8. Write a shell program to check whether the given string is palindrome or not.
9. Write an awk program to print sum, avg of students marks list
10. Write a shell script to compute no. of character sand words in each line of given file
11. Write a shell script to check whether the given input is a number or a string Note: Fundamentals of UNIX and Linux to be taught in the lab.

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MCA II SEMESTER	0	0	3	1.5

20MC2L09 COMPUTER NETWORKS LAB

Course Objectives:

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

• Understands the fundamental concepts of computer networking and OSI Reference model.

• Familiarize the student with the basic taxonomy and terminology of the computer networking area.

• Learn and understand the advanced networking concepts, preparing the student for entry advanced courses in computer networking.

• Develop and gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcomes (COs):

• Demonstrate Data link Protocols.

• Describe routing and congestion in network layer with routing algorithms and classify IPV 4 addressing scheme

• Implement and protocols of transport layer

PART – A

1) Implement the data link layer farming methods such as character stuffing and bit stuffing.

2) Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRCCCIP.

3) Implement Dijkstra's algorithm to compute the Shortest path through a graph.

4) Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm

5) Take an example subnet of hosts. Obtain broadcast tree for it.

PART – B

1) Design TCP iterative Client and server application to reverse the given input sentence

2) Design TCP client and server application to transfer file

3) Design a TCP concurrent server to convert a given text into upper case using multiplexing system call "select"

4) Design a TCP concurrent server to echo given set of sentences using poll functions

5) Design UDP Client and server application to reverse the given input sentence

6) Design UDP Client server to transfer a file

7) Design using poll client server application to multiplex TCP and UDP requests for converting a given text into uppercase.

8) Design a RPC application to add and subtract a given pair of integers

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MCA II SEMESTER	0	0	3	1.5

20MC2L10 JAVA PROGRAMMING LAB

Course Objectives:

• To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.

• To understand importance of Multi-threading & different exception handling mechanisms.

• To learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.

• To understand Java Swings for designing GUI applications based on MVC architecture

Course Outcomes (COs):

• Apply OOP concepts to solve real world problems

• Implement different forms of inheritance

• Create packages and to reuse them.

• Implement multi threaded programs using synchronization concepts

• Create user defined exceptions

• Design GUI applications using AWT and SWINGS.

List of Experiments:

1) The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1, 1. Every subsequent value is the sum of the 2 values preceding it. Write a Java Program that uses both recursive and non recursive functions to print the nth value of the Fibonacci sequence.

2) Write a Java Program that prompts the user for an integer and then prints out all the prime numbers up to that Integer.

3) Write a Java Program that checks whether a given string is a palindrome or not. Ex. MALAYALAM is a palindrome.

4) Write a Java Program for sorting a given list of names in ascending order.

5) Write a Java Program that illustrates how runtime polymorph his misachieved.

6) Write a Java Program to create and demonstrate packages.

7) Write a Java Program, using String Tokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.

8) Write a Java Program that reads on file name form the user then displays information about whether the file exists, whether the file is readable/ writable, the type of file and the length of the file in bytes and display the content of the using File Input Stream class.

9) Write a Java Program that displays the number of characters, lines and word sin text / text file.

10) Write an Applet that displays the content of a file.

11) Write a Java Program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +-*?% operations. Add a text field to display the result.

12) Write a Java Program for handling mouse events.

13) Write a Java Program demonstrating the life cycle of a thread.

14) Write a Java Program that lets users create Pie charts. Design your own user interface (with Swings &AWT).

15) Write a Java Program to implement a Queue, using user defined Exception Handling (also make use of throw, throws).

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MCA III SEMESTER	3	0	0	3

20MC3T01 MACHINE LEARNING WITH PYTHON

Course Objectives:

From the course the student will learn

- To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- Explore supervised and unsupervised learning paradigms of machine learning.
- To explore Deep learning technique and various feature extraction strategies.

Course Outcomes :

- Illustrate and comprehend the basics of Machine Learning with Python
- Demonstrate the algorithms of Supervised Learning and be able to differentiate linear and logistic regressions
- Demonstrate the algorithms of Unsupervised Learning and be able to understand the clustering algorithms
- Evaluate the concepts of binning, pipeline Interfaces with examples
- Apply the sentiment analysis for various case studies

UNIT I:

Introduction to Machine Learning with Python: Introduction to Machine Learning, basic terminology, Types of Machine Learning and Applications, Using Python for Machine Learning: Installing Python and packages from the Python Package Index, Introduction to NumPy, SciPy, matplotlib and scikit-learn, Tiny application of Machine Learning.

UNIT II:

Supervised Learning: Types of Supervised Learning, Supervised Machine Learning Algorithms: k- Nearest Neighbors, Regression Models, Naïve Bayes Classifiers, Decision Trees, Ensembles of Decision Trees, Kernelized Support Vector Machines, Uncertainty Estimates from Classifiers.

UNIT III:

Building good training datasets: Dealing with missing data, Handling categorical data,

partitioning a data set into separate training and test datasets, bringing features onto the same scale, selecting meaningful features, assessing feature importance with random forests. **Compressing data via dimensionality reduction**: Unsupervised dimensionality reduction via PCA, Supervised data compression via linear discriminant analysis

UNIT IV:

Learning best Practices for Model Evaluation and Hyper parameter tuning: streamlining workflows with pipelines, using k-fold cross validation to assess model performance, debugging algorithms with learning and validation curves, fine tuning machine learning models via grid search, looking at different performance evaluation metrics. **Combining different models for Ensemble learning:** learning with ensembles, combining classifiers via majority vote, bagging-building an ensemble of classifiers from bootstrap samples, leveraging weak learners via adaptive boosting

UNITV:

Working with Text Data (Data Visualization): Types of Data Represented as Strings, Example Application: Sentiment Analysis of Movie Reviews, Representing Text Data as a Bag of Words, Stop Words, Rescaling the Data with tf-idf, Investigating Model Coefficients, Approaching a Machine Learning Problem, Testing Production Systems, Ranking, Recommender Systems and Other kinds of Learning.

Reference Books:

1) Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Muller & Sarah Guido, Orielly Publications, 2019.
2) Python Machine Learning, Sebastian Raschka & Vahid Mirjalili, 3rd Edition, 2019.
3) Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley, 1stEdition, 2019
4) Machine Learning, Tom M. Mitchell, Mc Graw-Hill Publication,2017
5) Building Machine Learning Systems with Python, Luis Pedro Coelho, Willi Richert, 2nd Edition, 2015.
6) Programming and Problem Solving with Python, Ashok Namdev Kamthane, Amit Ashok Kamthane, TMH, 2019.

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MCA III SEMESTER	3	0	0	3

20MC3T02 Big Data Analytics

COURSE OBJECTIVES:

1) Optimize business decisions and create competitive advantage with Big Data analytics

2) Introducing Java concepts required for developing map reduce programs

3) Derive business benefit from unstructured data

4) Imparting the architectural concepts of Hadoop and introducing map reduce paradigm

COURSE OUTCOMES:

1) Understand methods for data summarization, query, and analysis.

2) Apply data modelling techniques to large data sets

3) Creating applications for Big Data analytics

4) Building a complete business data analytic solution.

5) Understand programming tools PIG & HIVE in Hadoop eco-system.

SYLLABUS

UNIT-I

Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

UNIT-II

Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Name node, Data node, Secondary Name node, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-III

Writing Map Reduce Programs: A Weather Dataset, Understanding Hadoop API for Map Reduce Framework (Old and New), Basic programs of Hadoop Map Reduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner.

UNIT-IV

Hadoop I/O: The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators

UNIT-V

Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

REFERENCE BOOKS:

1) Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC

2) Hadoop: The Definitive Guide by Tom White, 3 Edition, O'reilly

3) Hadoop in Action by Chuck Lam, MANNING Publ.9

4) Hadoop for Dummies by Dirk deRoos, Paul C. Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael

   Coss

5) Hadoop in Practice by Alex Holmes, MANNING Publ.

5) Hadoop Map Reduce Cookbook, Srinath Perera, Thilina Gunarathne

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MCA III SEMESTER	3	0	0	3

20MC3T03 WEB TECHNOLOGIES

Course Objectives:

- To Learn PHP language for server side scripting
- To introduce XML and processing of XML Data with Java
- To introduce Server side programming with Java Servlets and JSP
- To introduce Client side scripting with Java Script.

Course Outcomes:

- Analyze a web page and identify its elements and attributes.
- To acquire knowledge of xml fundamentals and usage of xml technology in electronic data interchange
- Build dynamic web pages using JavaScript (client side programming).
- To design and develop web based enterprise systems for the enterprises using technologies like jsp, servlet.
- Build web applications using PHP

Unit I:

Web Basics- Introduction, Concept of Internet- History of Internet, Protocols of Internet, World Wide Web, URL, Web Server, Web Browser. **HTML- Introduction**, History of HTML, Structure of HTML Document: Text Basics, Structure of HTML Document: Images and Multimedia, Links and webs, Document Layout, Creating Forms, Frames and Tables, Cascading style sheets.

Unit II:

XML Introduction- Introduction of XML, , Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

Unit III:

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a Servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions,

connecting to a database using JDBC.

Unit IV:

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP. Client-side Scripting: Introduction to JavaScript, JavaScript language – declaring variables, scope of variables, functions. event handlers (onClick, onSubmit etc.), Document Object Model, Form validation.

Unit V:

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

Reference Books:

1) Web Technologies, Uttam K Roy, Oxford University Press.

2) The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill.

3) Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dream tech.

4) Java Server Pages —Hans Bergsten, SPDO'Reilly.

5) Java Script, D. Flanagan

6)Beginning Web Programming-Jon Duckett WROX.

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MCA III SEMESTER	3	0	0	3

20MC3T04 **CRYPTOGRAPHY AND NETWORK SECURITY**

Course Objectives:

• To learn various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms,

• To Familiar in design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, andS/MIME

Course Outcomes:

• Explain Basic Principles, different security threats, countermeasures, foundation course of cryptography mathematics and Symmetric Encryption.

• Classify the basic principles of Asymmetric key algorithms and operations of asymmetric key cryptography.

• Design Cryptographic Hash Functions as SHA-3 and Digital Signatures as Elgamal

• Explain the concept of Revise Key Management and Distribution and User Authentication

• Determine the knowledge of Network and Internet Security Protocols such as S/MIME

UNIT I:

Basic Principles: Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography. **Symmetric Encryption:** Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

UNIT II:

Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography-Primes, primality Testing, Factorization, Asymmetric Key Cryptography-RSA Cryptosystem, Rabin Cryptosystem, ElGamal Cryptosystem, Elliptic Curve Cryptosystem

UNIT III:

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two

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Simple Hash Functions Requirements and Security Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), SHA-3. **Digital Signatures:** Elgamal Digital Signature Scheme, Schnorr Digital Signature, NIST Digital Signature Algorithm

Unit IV:

Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates. **User Authentication:** User Authentication, Remote User-Authentication Principle, Remote User-Authentication Using Symmetric Encryption, Kerberos, Remote User-Authentication Using Asymmetric Encryption

Unit V: Network and Internet Security Electronic Mail Security: Internet Mail Architecture, Email Formats, Email Threats and Comprehensive Email Security, S/MIME. **IP Security:** IP Security Policy, Encapsulating Security Payload, Combining Security Associations Internet Key Exchange

Reference Books:

1) Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGrawHill,2015

2) CryptographyandNetworkSecurity,WilliamStallings,GlobalEdition,7ePearson,2017

3) Network Security and Cryptography, First Edition, Bernard Meneges, Cengage Learning, 2018

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MCA III SEMESTER	3	0	0	3

20MC3T05 **SOFTWARE PROJECT MANAGEMENT**

Course Objectives:

At the end of the course, the student shall be able to:
- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course outcomes:

Upon the completion of the course students will be able to:-
- Apply the process to be followed in the software development life-cycle models
- Apply the concepts of project management & planning
- Implement the project plans through managing people, communications and change
- Conduct activities necessary to successfully complete and close the Software projects
- Implement communication, modeling, and construction & deployment practices in software development

UNIT-I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation. **Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II:

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

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UNIT- III:

Model based software architectures: A Management perspective and technical perspective.

Work Flows of the process: Software process workflows, Iteration workflows.

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments. **Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT- IV:

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT-V:

Agile Methodology, adapting to Scrum, Patterns for Adopting Scrum, Iterating towards Agility. Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Reference Books:

1) Software Project Management, Walker Royce, PEA, 2005.

2) Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.

3) The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois, Jez Humb,1st Edition, O'Reilly publications,2016.

4) Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH

5) Software Project Management, Joel Henry, PEA

6) Software Project Management in practice, Pankaj Jalote, PEA,2005,

7) Effective Software Project Management, Robert K.Wysocki,Wiley,2006

8) Project Management in IT, Kathy Schwalbe, Cengage

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MCA III SEMESTER	3	0	0	3

20MC3T06 **CLOUD COMPUTING**

Course Objectives:

The main objective of the course is to implement Virtualization, Task Scheduling algorithms, apply Map-Reduce concept to applications, building Private Cloud and to know the impact of engineering on legal and societal issues involved

Course Outcomes:

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

- Interpret the key dimensions of the challenge of Cloud Computing
- Examine the economics, financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
- Evaluate own organizations' needs for capacity building and training in cloud computing- related IT areas
- Illustrate Virtualization for Data-Center Automation

UNIT–I:

Systems modeling, Clustering and virtualization: Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency.

UNIT–II:

Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Centre Automation.

UNIT–III:

Cloud Platform Architecture: Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource

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Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

UNIT–IV:

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments. **Storage Systems**: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system, Apache Hadoop, Big Table, Megastore, Amazon Simple Storage Service (S3).

UNIT-V:

Cloud Resource Management and Scheduling : Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling Map Reduce Applications Subject to Deadlines.

Reference Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra M K Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
3. Cloud Computing, AH and son approach, Arshadeep Bahga, Vijay Madisetti, University Press
4. Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill.rp 20ll.
5. Enterprise Cloud Computing Gautam Shroif, Cambridge University Press. 2010.
6. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'Really SPD,rp 20ll.

Note: The students shall register in any of the Clouds like AWS/Azure, etc and learn about cloud services.

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MCA III SEMESTER	3	0	0	3

20MC3T07 **CYBER SECURITY**

Course Objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks□.

Course Outcomes:

- Understand the basics of cyber security
- Understand types of cybercrimes and cyber laws
- Understand Cyber crime concepts with respect to Mobile Devices
- Understand Organizational implications on cyber security
- Understand privacy policy mechanisms

UNIT I:

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT II:

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing

UNIT III:

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Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, OrganizationalMeasuresforHandlingMobile,OrganizationalSecurityPoliciesandMeasuresin Mobile Computing Era, Laptops

UNIT IV:

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. **Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT V:

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Reference Books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

3. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

4. Introduction to Cyber Security, Chwan- Hwa (john) Wu, J. David Irwin, CRC Press T&F Group

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MCA III SEMESTER	0	0	3	1.5

<div align="center">20MC3T08 ADVANCED DATABASES</div>

Course Objectives: To introduce basic concepts of different types of databases like distributed databases, object oriented databases and parallel databases and to give basics of designing different types of databases.

Course Outcomes: By the completion of the course, the students should be able to:

- Outline the concepts of relational database system.

- Understand the basic concepts in distributed databases.

- Analyze the advanced concepts of distributed databases.

- Understand the design issues in parallel databases.

- Apply the concepts of object oriented databases to solve real world problems.

UNIT – I:

RELATIONAL MODEL ISSUES: ER model, Normalization, Query processing, query optimization, transaction processing, Database tuning, comparison of different databases.

UNIT – II:

DISTRIBUTED DBMS: Concepts and Design, Introduction, Overview of Networking, Functions and architectures of a DDBMS, Distributed Relational Database Design, and Transparencies in a DDBMS.

UNIT – III:

DISTRIBUTED DBMS: Advanced concepts- Distributed Transaction Management, Distributed Concurrency control, Distributed Deadlock Management, Distributed Database Recovery, Distributed query optimization.

UNIT – IV:

Introduction to Parallel databases, architectures for parallel databases, Parallel Query Evaluation – data partitioning and parallelizing sequential operator evaluation code, Parallelizing individual operations, and parallel Query optimization.

UNIT – V:

Object Database System: Abstract data types, Objects identity and reference types, Inheritance, Database design for ORDBMS, ODMG (Object Data Management Group) data model, ODL (Object Definition Language), OQL (Object Query Language).

References:

1. Thomas Connolly, Carolyn Begg ―Database Systems, A Practical Approach to Design, Implementation and Management‖,Tthird edition, Pearson Education
2. Raghuramakrishnan and Johannes Gehrke: ―Database Management Systems‖, 3rdEdition, TMH, 2006.

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MCA III SEMESTER	0	0	3	1.5

20MC3L09 **MACHINE LEARNING WITH PYTHON LAB**

Course Objectives:

- Make use of Datasets in implementing the machine learning algorithms
- Implementthemachinelearningconceptsandalgorithmsinanysuitablelanguageofchoice.
- Design Python programs for various Learning algorithms.

Course Outcomes (COs): At the end of the course, student will be able to

- Implement procedures for the machine learning algorithms
- Design Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real world problems

Note: Consider any dataset from kaggle

Experiment 1:

Installation of Python and its packages (Pandas, NumPy, SciPy, matplotlib and scikit-learn) (Install Anaconda, Jypyter Notebook, and Programs covering basic concepts in Python Programming)

Basics of Python:

Write a program to read two numbers from user and display the result using bitwise & , | and

^ operators on the numbers.

Write a program to calculate the sum of numbers from 1 to 20 which are not divisible by 2, 3 or 5. Write a program to find the maximum of two numbers using functions.

Implement slicing operation on strings and lists.

Experiment 2:

Implement python program to load structured data onto Data Frame and perform exploratory data analysis

Implement python program for data preparation activities such as filtering, grouping, ordering and joining of datasets.

Experiment 3:

Implement Python program to prepare plots such as bar plot, histogram, distribution plot, box plot, scatter plot.

Experiment 4:

Implement Simple Linear regression algorithm in Python

Implement Gradient Descent algorithm for the above linear regression model

Experiment 5:

Implement Multiple linear regression algorithm using Python.

Experiment 6:

Implement Python Program to build logistic regression and decision tree models using the Python package stats model and sklearn APIs.

Experiment 7:

Implement Python Program to perform the activities such as

- splitting the data set into training and validation datasets

- building model using Python package on training dataset and test on the validation dataset

Experiment 8:

Write a Python program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment 9:

Implement Support vector Machine algorithm on any data set

Experiment 10:

Write a program to implement the naïve Bayesian classifier for a sample training dataset store dasa.csv file. Compute the accuracy of the classifier, considering few test datasets.

Experiment 11:

Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

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Experiment 12:

Assuming a set of documents that need to be classified, use the naive Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision and recall for your data set.

Experiment 13:

Implement PCA on any Image dataset for dimensionality reduction and classification of images into different classes

Experiment 14:

Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

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MCA III SEMESTER	0	0	3	1.5

20MC3L10 **Big Data Analytics LAB**

COURSE OBJECTIVE:

To understand data summarization, and modelling techniques and create applications for Big Data Analytics

COURSE OUTCOMES:

1) Preparing for data summarization, query and analysis.

2) Applying data modelling techniques to large data sets.

3) Creating applications for Big data Analytics.

4) Building a complete business data analytic solution.

LIST OF LAB EXPERIMENTS

Week 1, 2:

1. Implement the following Data structures in Java

  a) Linked Lists b) Stacks c) Queues d) Set e) Map

Week 3, 4:

2. (i) Perform setting up and Installing Hadoop in its three operating modes:

- Standalone,
- Pseudo distributed,
- Fully distributed

(ii)Use web based tools to monitor your Hadoop setup.

Week 5:

3. Implement the following file management tasks in Hadoop:

- Adding files and directories
- Retrieving files
- Deleting files
- Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Week 6:

4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

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Week 7:

5. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi-structured and record-oriented.

Week 8:

6. Implement Matrix Multiplication with Hadoop Map Reduce

Week 9, 10:

7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Week 11, 12:

8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions,   and   indexes

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MCA III SEMESTER	0	0	4	2

20MC3L11 **WEB TECHNOLOGIES LAB**

Course Objectives:
- To implement the web pages using HTML and apply styles.
- Able to develop a dynamic webpage by the use of java script.
- Design to create structure of webpage, to store the data in web document, and transport information through web.
- Able to write a well formed / valid XML document.

Course Outcomes:
- Create dynamic and interactive web pages using HTML, CSS & JavaScript
- Experiment with Learn and implement XML concepts
- Develop web applications using PHP
- Show the Install Tomcat Server and execute client-server programs
- Implement programs using Ruby programming

Experiment 1:

Develop static pages (using HTML and CSS) of an online book store. The pages should resemble: www.flipkart.com The website should consist the following pages.

a) Home page
b) Registration and user Login
c) User Profile Page
d) Books catalog
e) Shopping Cart
f) Payment By credit card
g) Order Conformation

Experiment 2:

Create and save an XML document on the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.

Experiment 3:

Write a PHP script to merge two arrays and sort them as numbers, in descending order.

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Experiment 4:

Write a PHP script that reads data from one file and write into another file.

Experiment 5:

Write a PHP script to print prime numbers between 1-50.

Experiment 6:

Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.

Experiment 7:

Write a PHP script to: a. Find the length of a string. b. Count no of words in a string. c. Reverse a string.

d. Search for a specific string.

Experiment 8:

Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.

Experiment 9:

Redo the previous task using JSP by converting the static webpagesofassignments2into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.

Experiment 10:

Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form). Practice 'JDBC' connectivity. Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the website, whenever a new user clicks the submit button in the registration page.

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Experiment 11:

Write a JSP which does the following job: Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.

Experiment 12:

Create a simple visual be an with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click.

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MCA IV SEMESTER	3	0	0	3

20MC4T01 **DIGITAL MARKETING**

Course Objectives:

Digital marketing aims at being SMART (Specific, Measurable, Achievable, Relevant and Time Related) so that people can withstand against competitors.

Course Outcomes

• Explain about web pages with basic HTML5, DHTML tags using CSS and XML, the overview of W3CDOM.

• Discuss the key elements of a digital Java Scripts.

• Apply search engine optimization techniques to a website.

• Illustrate how the effectiveness of a digital marketing campaign can be measured

• Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs

UNIT I:

HTML: Introduction, HTML5, Audio Elements, Video Elements, Organizing Elements.
Scripting Documents: Dynamic Document content, Document properties, Legacy DOM, Document Collections, Overview of the W3C DOM, Traversing a Document, Finding Elements in a Document, Modifying a Document, Adding Content to a Document Example

UNIT II:

Cascading Style Sheets and Dynamic HTML: Overview of CSS, CSS for DHTML Scripting inline Styles, Scripting computed styles, Scripting CSS Classes, Scripting Style Sheets, **Java Script and XML:** Obtaining XML Documents, Manipulating XML with the DOM API, Transforming XML with XSLT querying XML with X path, Serializing XML, Example, XML and Web services.

UNIT III:

Search Engine Optimization (SEO): Searching Engine Marketing, Search Engine Optimization, Measuring SEO Success, Mapping with SEO Journey, **Search**

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Advertising: Online Advertising Payment Models, Search Advertising (Desktop & Mobile Devices), Planning & Executing a search Advertising Camping, Strategic Implications of Advertising on the search Network.

UNIT IV:

Search Media Marketing: What is Social Media? Social Media Marketing, Social Media Marketing Strategy, Adopting Social Media in Organizations: Internal Learning, Paid-Owned-Earned Media, Social CRM,

Mobile Marketing:

Mobile Internet in India, What is Mobile Marketing? Email Marketing Strategy, Forms of Mobile Marketing, Mobile Advertising, M-Commerce.

UNIT V:

E-Mail Marketing: E-Mail Marketing in India, What is E-Mail Marketing? E-Mail Marketing Strategy, Executing E-Mail Marketing,

Internet Marketing:

Internet Marketing Strategy, Content Marketing, Content Marketing in India.

Reference Books:

1. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, Ian Dodson, Wiley,2016

2. Programming the World Wide Web, Robet W Sebesta, Pearson, 8[th]edition,2015

3. Fundamentals of Digital Marketing, Second Edition, Pearson Paperback,2019

4. Internet Marketing- A Practical approach in the India Context by Moutusy Maity, Oxford

5. Java Script: The Definite Guide David Flanagan, O' Reilly Publisher

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MCA IV SEMESTER	3	0	0	3

20MC4T02 **HUMAN RESOURCE MANAGEMENT**

Course Objectives:

- Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes.
- Administer and contribute to the design and evaluation of the performance management program.
- Facilitate and support effective employee and labor relations in both non-union and union environments.

Course Outcomes:

- Explain the importance of human resources and their effective management in organizations
- Demonstrate a basic understanding of different tools used in forecasting and planning, human resource need.
- Describe the meanings of terminology and tools used in managing employees effectively
- Make use of Record governmental regulations affecting employees and employers
- Analyze the key issues related to administering the human elements such as motivation, compensation, appraisal, career planning, diversity, ethics, and training

UNIT I:

HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- - HR policies, Strategies to increase firm performance - Role and position of HR department – aligning HR strategy with organizational strategy - HRM at global perspective -challenges – cross- cultural problems – emerging trends in HRM.

UNIT II:

Investment perspectives of HRM: HR Planning – Demand and Supply forecasting - Recruitment and Selection- Sources of recruitment - Tests and Interview Techniques - Training and Development – Methods and techniques – Training evaluation - retention - Job Analysis – job description and specifications - Management development - HRD concepts.

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UNIT III:

Wage and Salary Administration: Concept- Wage Structure- Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials - Job design and Evaluation- Incentive Payment Systems. Welfare management: Nature and concepts – statutory and non-statutory welfare measures – incentive mechanisms.

UNIT IV:

Performance Evaluation: Importance – Methods – Traditional and Modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation, Concepts and Principles- Influencing Factors- Current Trends in Compensation- Methods of Payments - compensation mechanisms at international level.

UNIT V:

Managing Industrial Relations: Trade Unions - Employee Participation Schemes- Collective Bargaining–Grievances and disputes resolution mechanisms – Safety at work – nature and importance – work hazards – safety mechanisms - Managing work place stress.

References:

1) K Aswathappa: "Human Resource and Personnel Management", Tata McGraw Hill, New Delhi, 2013

2) N. Sambasiva Rao and Dr. Nirmal Kumar: "Human Resource Management and Industrial Relations", Himalaya Publishing House, Mumbai

3) Mathis, Jackson, Tripathy:"Human Resource Management: Asouth-Asin Perspective", Cengage Learning, New Delhi, 2013

4) Subba Rao P: "Personnel and Human Resource Management-Text and Cases", Himalaya Publications, Mumbai, 2013.

5) Madhurima Lall, Sakina Qasim Zasidi: "Human Resource Management", Excel Books, New Delhi, 2010

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MCA IV SEMESTER	3	0	0	3

20MC4T03 **AD-HOC AND SENSOR NETWORKS**

Course Objectives:

• From the course the student will earn
• Architect sensor networks for various application setups
• Devise appropriate data dissemination protocols and model links cost
• Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers
• Evaluate the performance of sensor networks and identify bottlenecks

Course Outcomes:

• Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks
• Determine the principles and characteristics of wireless sensor networks
• Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks
• Illustrate the various sensor network Platforms, tools and applications
• Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs

UNIT I:

Introduction : Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio propagation Mechanisms ,Characteristics of the Wireless channel mobile ad hoc networks (MANETs), **Wireless Sensor Networks (WSNs):** concepts and architectures, Applications of Ad Hoc and Sensor Networks, Design Challenges in Ad hoc and Sensor Networks.

UNIT II:

MAC Protocols For Ad Hoc Wireless Networks: Issues in designing a MAC Protocol, Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention based protocols, Contention based protocols with Reservation Mechanisms, Contention

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based protocols with Scheduling Mechanisms, Multi channel MAC - IEEE 802.11.

UNIT III:

Routing Protocols And Transport Layer In Ad Hoc Wireless Networks: Routing Protocol: Issues in designing a routing protocol for Ad hoc networks, Classification, proactive routing, reactive routing(on- demand), hybrid routing, Transport Layer protocol for Ad hoc networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer solutions –TCP over Ad hoc wireless, Network Security, Security in Ad Hoc Wireless Networks, Network Security Requirements.

UNIT IV:

Wireless Sensor Networks (WSNS) and Mac Protocols: Single node architecture - hardware and software components of a sensor node, **WSN Network architecture:** typical network architectures, data relaying and aggregation strategies, **MAC layer protocols:** self-organizing, Hybrid TDMA/FDMA and CSMA based MAC -IEEE802.15.4.

UNIT V:

WSN Routing, Localization & Qos: Issues in WSN routing, OLSR, Localization, Indoor and Sensor Network Localization, absolute and relative localization, triangulation, QOS in WSN, Energy Efficient Design, Synchronization.

Reference Books:

1) "Ad Hoc Wireless Networks: Architectures and Protocols ", C. Siva Ram Murthy, and B. S. Manoj, Pearson Education,2008
2) "Wireless Adhoc and Sensor Networks", Labiod. H, Wiley, 1stedition-2008
3) "Wireless ad -hoc and sensor Networks: theory and applications", Li, X, Cambridge University Press, fifthedition-2008.
4) "Ad Hoc & Sensor Networks: Theory and Applications", 2nd edition, Carlos De Morais Cordeiro, Dharma Prakash Agrawal, World Scientific Publishing Company, 2011
5) "Wireless Sensor Networks", Feng Zhao and Leonides Guibas, Elsevier Publication 2nd edition- 2004
6) "Protocols and Architectures for Wireless Sensor Networks", Holger Karl and Andreas Willig, Wiley, 2005 (soft copy available)

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20MC4T04 **BLOCK CHAIN TECHNOLOGIES**

Course Objectives:
- Impart strong technical understanding of Blockchain technologies
- Develop familiarity of current technologies, tools, and implementation strategies
- Introduce application areas, current practices, and research activity

Course Outcomes (Cos): At the end of the course, student will be able to
- Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.
- Identify the risks involved in building Blockchain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Cryptocurrency markets.
- Examine how to profit from trading cryptocurrencies.

UNIT I:

The consensus problem, Asynchronous Byzantine Agreement, AAP protocol and its analysis, Nakamoto Consensus on permission-less, nameless, peer-to-peer network, Abstract Models for BLOCKCHAIN, GARAY model, RLA Model, Proof of Work (PoW) as random oracle, formal treatment of consistency, liveness and fairness-Proof of Stake (PoS) based Chains, Hybrid models (PoW+PoS).

UNIT II:

Cryptographic basics for cryptocurrency, A short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography

UNIT III:

Bitcoin, Wallet, Blocks, Merkley Tree, hardness of mining, transaction verifiability, anonymity, forks, double spending, mathematical analysis of properties of Bitcoin.

UNIT IV:

Ethereum: Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity, Smart Contracts, some attacks on smart contracts

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UNIT V:

(Trends and Topics): Zero Knowledge proofs and protocols in Block chain, Succinct non interactive argument for Knowledge (SNARK), pairing on Elliptic curves, Zcash.

Reference Books:

1) Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available)

2) Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and crypto currency, IEEE Symposium on security and Privacy, 2015 (article available for free download) {curtain raiser kind of generic article, written by seasoned experts and pioneers}.

3) J.A.Garayet al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOl9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048). (serious beginning of discussions related to formal models for bit coin protocols).

4) R. Passetal, Analysis of Block chain protocol in Asynchronous networks, EUROCRYPT 2017, print.iacr.org/2016/454).A significant progress and consolidation of several principles).

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MCA IV SEMESTER	3	0	0	3

20MC4T05 **SOFTWARE TESTING METHODOLOGIES**

Course Objectives:

• To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing

• To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report

• To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing

• To understand software test automation problems and solutions

• To learn how to write software test documents and communicate with engineers in various forms

Course Outcomes:

• Identify and understand various software testing problems.

• Design and conduct a software test process for a software project

• Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects

• Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems

UNIT I:

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation

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UNIT II:

Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT III:

Static Testing: Inspections, Structured Walkthroughs, Technical Reviews

Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing

Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques

UNIT IV:

Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite.

Software Quality Management: Software Quality metrics, SQA models **Debugging:** process, techniques, correcting bugs.

UNIT V:

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit. Test Automation using Selenium tool.

Testing Object Oriented Software: basics, Object oriented testing

Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems

Reference books:

1) Software Testing, Principles and Practices, Naresh Chauhan, Oxford.
2) Software Testing- Yogesh Singh, CAMBRIDGE.
3) Software testing techniques – Baris Beizer, Dream tech, second edition.
4) Effective Methods for Software testing, Willian E Perry, 3ed,Wiley

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20MC4T06 **E Commerce**

COURSE OBJECTIVES:

1. Discuss the benefits and trade-offs of various e-commerce clicks and bricks alternatives.

2. Identify the essential processes of an e-commerce system.

3. Identify several factors and web store requirements needed to succeed in e-commerce.

4. Understand the main technologies behind e-commerce systems and how these technologies interact.

5. Define various electronic payment types and associated security risks and the ways to protect against them.

COURSE OUTCOMES:

1. Identify and analyze stake holder needs

2. Understand electronic payment systems

3. Acquire Knowledge on Intra organizational commerce

4. Design and prepare marketing strategies for corporate digital Library

5. Design and prepare accurate e-commerce related presentations of multimedia information taking into account technical and aesthetic considerations;

SYLLABUS

UNIT–I

Electronic Commerce-Frame work, the anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce – Mercantile Process models.

UNIT–II

Electronic payment systems– Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter-Organizational Commerce – EDI, EDI Implementation, Value-added networks.

UNIT–III

Intra Organizational Commerce – Work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT – IV

Corporate Digital Library – Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing – Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT – V

Consumer Search and Resource Discovery – Information search and Retrieval, Commerce Catalogues, Information Filtering Multimedia – key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.

REFERENCES:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson.(Units 1,2,3,4,5)
2. Electronic Commerce – Gary P.Schneider – Thomson.
3. The E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.
4. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon,

    Elizabeth Chang, John Wiley.