DEPARTMENT OF COMPUTTER SCIENCE & ENGINEERING
JNTUH COLLEGE OF ENGINEERING HYDERABAD (AUTONOMOUS)
Kukatpally, Hyderabad - 500 085, Telangana, India

MASTER OF COMPUTER APPLICATIONS (MCA)

COURSE STRUCTURE & SYLLABUS (R20)
Effective from Academic Year 2020-21 Admitted Batch

I YEAR I SEMESTER

Category	Course Title	L	T	P	Credits
Core Course - I	Mathematical Foundations of Computer Science	3	0	0	3
Core Course - II	C and Data Structures	3	0	0	3
Core Course – III	Python Programming (with Lab)	3	0	2*	4
Core Course – IV	Computer Organization	3	0	0	3
Core Course- V	Database Management Systems	3	0	0	3
Core Course – VI	Accounting and Financial Management	3	0	0	3
Laboratory – I	C and Data Structures Lab	0	0	2	1
Laboratory – II	Database Management Systems Lab	0	0	2	1
	Total Credits	**18**	**0**	**6**	**21**

*Only internal assessment

I YEAR II SEMESTER

Category	Course Title	L	T	P	Credits
Core Course - I	Java Programming	3	0	0	3
Core Course - II	Operating Systems (with Lab)	3	0	2*	4
Core Course – III	Computer Networks	3	0	0	3
Core Course – IV	Data Mining (with R Programming Lab)	3	0	2*	4
Core Course – V	Software Engineering (with Lab)	3	0	2*	4
Core Course – VI	Mobile Application Development	3	0	0	3
Laboratory – I	Mobile Application Development Lab	0	0	2	1
Laboratory – II	Java Programming Lab	0	0	2	1
Audit Course – I (Mandatory)	Cyber Security	**2**	**0**	**0**	**0**
	Total Credits	**20**	**0**	**10**	**23**

* Only internal assessment

II YEAR I SEMESTER (III SEMESTER)

Category	Course Title	L	T	P	Credits
Core Course - I	Network Administration (with Lab)	3	0	2*	4
Core Course - II	Web Technologies	3	0	0	3
Core Course – III	Internet of Things (with Lab)	3	0	2*	4
Professional Elective - I	Cloud Applications Information Retrieval Systems Information Systems Audit and Control Design and Analysis of Algorithms	3	0	0	3
Professional Elective - II	Mobile Computing Software Testing Methodologies Biometrics e-Commerce	3	0	0	3
Laboratory – I	Web Technologies Lab	0	0	2	1
Project	Project Phase I	0	0	4	2
Audit Course – II (Mandatory)	Artificial Intelligence	**2**	**0**	**0**	**0**
	Total Credits	**17**	**0**	**10**	**20**

*Only internal assessment

II YEAR II SEMESTER (IV SEMESTER)

Category	Course Title	L	T	P	Credits
Professional Elective - III	Machine Learning Blockchain Technology Big Data Analytics Virtual and Augmented Reality	3	0	0	3
Open Elective - I	Optimization Techniques Cyber Laws Management Information Systems Entrepreneurship	3	0	0	3
Seminar	Seminar	0	0	4	2
Project	Project Phase II	0	0	16	8
	Total Credits	**6**	**0**	**20**	**16**

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

MCA I Year I Sem
        L   T   P   C
        3   0   0   3

Prerequisites:
1. An understanding of Math in general is sufficient.

Objectives:
1. Introduces the elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles; recurrence relations and generating functions

Outcomes:
1. Demonstrate the ability to understand and construct precise mathematical proofs
2. Demonstrate the ability to use logic and set theory to formulate precise statements
3. Acquire the knowledge to analyse and solve counting problems on finite and discrete structures
4. Demonstrate the ability to describe and manipulate sequences
5. Demonstrate the ability to apply graph theory in solving computing problems

UNIT - I
The Foundations Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT - II
Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations: Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

UNIT - III
Algorithms, Induction and Recursion: Algorithms, The Growth of Functions, Complexity of Algorithms.
Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.

UNIT - IV
Discrete Probability and Advanced Counting Techniques: An Introduction to Discrete Probability, Probability Theory, Bayes' Theorem, Expected Value and Variance.
Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

UNIT - V
Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

TEXTBOOKS
1. Discrete Mathematics and Its Applications with Combinatorics and Graph Theory-Kenneth H Rosen, 7th Edition, TMH.

REFERENCES
1. Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R. Manohar, TMH,
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Teodore P. Baker, 2nd ed., Pearson Education.
3. Discrete Mathematics- Richard Johnsonbaugh, 7th ed., Pearson Education.
4. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.
5. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5th edition, Pearson Education.

C AND DATA STRUCTURES

MCA I Year I Sem

	L	T	P	C
	3	0	0	3

Prerequisites:
1. Requires analytical skills and logical reasoning.

Objectives:
1. Understand and Learn algorithms, Pseudo code and Flow chart.
2. Acquire the knowledge of Programming Environment
3. Learn basics of computer programming
4. Gain the knowledge of C Language
5. Acquire the skills in applying various concepts of C
6. Provides hands-on experience with the concepts of programming in C

Outcomes:
1. Identify computational tasks to apply for writing programming
2. Identify the right concept in C to apply based on the requirement of the problem
3. Develop solutions for computational problems and real-life applications through programming

UNIT - I
Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.
Introduction to C Language: Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

UNIT - II
Statements: if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.
Designing Structured Programs: Functions, basics, user defined functions, inter function communication, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions,
Arrays: Concepts, using arrays in C, inter function communication, array applications, two–dimensional arrays, multidimensional arrays, C program examples. Concepts,

UNIT - III
Pointers and Strings: Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments. Pre-processor commands, example C programs.
C Strings, String Input/ Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

UNIT-IV:
Derived Types: Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.
Input and Output: Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C program examples.

UNIT - V
Sorting and Searching: selection sort, bubble sort, insertion sort, linear and binary search methods. **Data Structures:** Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

TEXTBOOKS

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, 3rd Edition, Cengage Learning.
2. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education
3. Head First C, David Griffiths, Dawn Griffiths, O'reilly Publications 2012.

REFERENCES
1. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
2. C: The Complete Reference by Herbert Schildt, 4th Edition, TMH
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
4. Learn to Code with C : The MagPi Essentials by Simon Long
5. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 5th Edition, Pearson Education.
6. Let Us C: Authentic Guide to C Programming Language by Yashvanth P. Kanetkar

PYTHON PROGRAMMING

MCA I Year I Sem

L T P C

3 0 2* 4

Prerequisites:
1. Requires analytical skills and logical reasoning.

Objectives:
1. To learn syntax and semantics and create functions in Python.
2. To handle strings and files in Python.
3. To understand lists, dictionaries and regular expressions in Python.
4. To implement object oriented programming concepts in Python.
5. To build web services and introduce network and database programming in Python.

Outcomes:
1. Demonstrate proficiency in handling Strings and File Systems.
2. Create, run and manipulate Python programs using core data structures like Lists, Dictionaries and use Regular Expressions.
3. Interpret the concepts of Object-Oriented Programming as used in Python.
4. Implement applications related to Network Programming, Web Services and Databases in Python.

UNIT - I
Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types
Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules
Sequences - Strings, Lists, and Tuples, Mapping and Set Types

UNIT - II
Files: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules
Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management,
Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module, Related Modules, Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

UNIT - III
Regular Expressions: Introduction, Special Symbols and Characters, Res and Python
Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT - IV
GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

Web Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application, Advanced CGI, Web (HTTP) Servers

UNIT - V
Database Programming: Introduction, Python Database Application Programmer's Interface (DB-API), Object Relational Managers (ORMs), Related Modules

TEXTBOOKS
1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCES
1. Python for Programmers, Paul Deitel, Harvey Deitel, Pearson.
2. Think Python, Allen Downey, Green Tea Press
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
5. Learning Python, Mark Lutz, O'Reilly

PYTHON PROGRAMMING LAB

MCA I Year I Sem

Objectives:
1. To be able to introduce core programming basics and program design with functions using Python programming language.
2. To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
3. To understand the high-performance programs designed to strengthen the practical expertise.

Outcomes:
1. Acquire the understanding of the basic concepts, scripting and the contributions of scripting language
2. Demonstrate the ability to explore python especially the object oriented concepts, and the built in objects of Python.
3. Create practical and contemporary applications such as TCP/IP network programming, Web applications, discrete event simulations

List of Experiments:

1. (a) Write a Python program to sum all the items in a list.

   (b) Write a Python program to remove duplicates from a list

2. (a) Write a Python program to sort (ascending and descending) a dictionary by value

   (b) Write a Python script to add a key to a dictionary

3. (a) Write a Python program to create a tuple

   (b) Write a Python program to convert a tuple to a string

4. (a) Write a Python program to count the number of characters (character frequency)
      in a string

   (b) Write a Python program to count and display the vowels of a given text

5. (a) Write a Python program to read first n lines of a file

   (b) Write a Python program to append text to a file and display the text.

6. Python program to demonstrate basic operations on single array.

7. Write a Python program that matches a string that has a followed by three 'b'.

8. Write a Python program Create a thread class to print the date

9. Write a program to demonstrate multithreading in python

10. Write a Python GUI program to import Tkinter package and create a window and set

    its title

11. Write a Python GUI program to create a label and change the label font style

12. Write a Python GUI program to create a window and disable to resize the window using tkinter module

13. Write a Python program to demonstrate Client Server programs

14. Write a Python program to create a SQLite database and connect with the database and print the version of the SQLite database

15. Write a Python program to connect a database and create a SQLite table within the database

COMPUTER ORGANIZATION

MCA I Year I Sem
        L T P C
        3 0 0 3

Objectives
1. The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
2. It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

Outcomes
1. Understand the basics of instructions sets and their impact on processor design.
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
4. Design a pipeline for consistent execution of instructions with minimum hazards.
5. Recognize and manipulate representations of numbers stored in digital computers

UNIT - I
Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture, Basics organization of computer.
Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.
Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT - II
Micro Programmed Control: Control memory, Address sequencing, micro program example, design of control unit.
Central Processing Unit: Introduction General Register Organization, Stack organization Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT - III
Data Representation: Data types, Complements, Fixed Point Representation, Conversion of Fractions Floating Point Representation.
Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic Unit, Decimal Arithmetic operations.

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

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

UNIT - V
Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.
Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Arrey Processor.
Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Symmetric multiprocessor, Cache Coherence.

TEXTBOOKS
1. Computer System Architecture – M. Moris Mano, Revised 3rd Edition, Pearson.

REFERENCES
1. Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings 6th Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson.

DATABASE MANAGEMENT SYSTEMS

MCA I Year I Sem   **L   T   P   C**
                                                                    3   0   0   3

Prerequisites
1. A course on "Data Structures"

Objectives
1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Outcomes
1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Acquire familiarity with database storage structures and access techniques

UNIT - I
Database System Applications: A Historical Perspective, File Systems versus a DBMS**,** the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS
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

UNIT - II
Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views.
Relational Algebra**,** Tuple relational Calculus, Domain relational calculus.

UNIT - III
SQL: Queries, Constraints, Triggers: Basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.
Schema refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT - IV
Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT - V
Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and

Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXTBOOKS
1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, 3rd Edition, Tata McGraw Hill
2. Database System Concepts, Silberschatz, Korth, 7th edition, McGraw hill.

REFERENCES
1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

ACCOUNTING AND FINANCIAL MANAGEMENT

MCA I Year I Sem

	L	T	P	C
	3	0	0	3

Objectives:

1. To learn Financial Management and Accounting
2. To learn different types of costing

Outcomes:

1. Prepare balance sheets of budget.
2. Get the skill to manage finances of a firm/company

UNIT - I
Introduction to Accounting: Principles, concepts, conventions, double entry system of accounting, introduction of basic books of accounts ledgers.
Preparation of Trial Balance: Final accounts - company final accounts.

UNIT - II
Financial Management: Meaning and scope, role, objectives of time value of money - over vitalization - under capitalization - profit maximization - wealth maximization - EPS maximization.
Ratio Analysis: Advantages - limitations - Fund flow analysis - meaning, importance, preparation and interpretation of Funds flow and cash flow statements-statement.

UNIT - III
Costing: Nature and importance and basic principles, Absorption costing vs. marginal costing - Financial accounting vs. cost accounting vs. management accounting.
Marginal Costing and Break-even Analysis: Nature, scope and importance - practical applications of marginal costing, limitations and importance of cost - volume, profit analysis.

UNIT - IV
Standard Costing and Budgeting: Nature, scope and computation and analysis - materials variance, labor variance and sales variance - budgeting - cash budget, sales budget - flexible Budgets, master budgets.

UNIT - V
Introduction to Computerized Accounting System: coding logic and codes, master files, transaction files, introduction documents used for data collection, processing of different files and Outputs obtained.

TEXTBOOKS
1. Van Horne, James, C: Financial Management and Policy, 12th Edition, Pearson Education.
2. Financial Accounting, S.N.Maheshwari, Sultan Chand Company.
3. Financial Management, S.N.Maheshwari, Sultan Chand Company

C AND DATA STRUCTURES LAB

MCA I Year I Sem

	L	T	P	C
	0	0	2	1

Co-requisites:
1. "C and Data Structures" course

Objectives:
1. It covers various concepts of C programming language
2. It introduces searching and sorting algorithms
3. It provides an understanding of data structures such as stacks and queues.

Course Outcomes:
1. Develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
2. Implement searching and sorting algorithms

Week 1:

1. Write a C program to find the sum of individual digits of a positive integer.

2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

4. Write a C program to find the roots of a quadratic equation.

Week 2:

5. Write a C program to find the factorial of a given integer.

6. Write a C program to find the GCD (greatest common divisor) of two given integers.

7. Write a C program to solve Towers of Hanoi problem.

8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 3:

9. Write a C program to find both the largest and smallest number in a list of integers.

10. Write a C program that uses functions to perform the following:

    i) Addition of Two Matrices   ii) Multiplication of Two Matrices

Week 4:

11. Write a C program that uses functions to perform the following operations:

i) To insert a sub-string in to a given main string from a given position.

ii) To delete n Characters from a given position in a given string.

12. Write a C program to determine if the given string is a palindrome or not

13. Write a C program that displays the position or index in the string S where the string T begins, or -1 if S doesn't contain T.

14. Write a C program to count the lines, words and characters in a given text.

Week 5:

15. Write a C program to generate Pascal's triangle.

16. Write a C program to construct a pyramid of numbers.

17. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+ +x^n$

Week 6:

18. 2'scomplement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

19. Write a C program to convert a Roman numeral to its decimal equivalent.

Week 7:

20. Write a C program that uses functions to perform the following operations:

 iii) Reading a complex number

 iv) Writing a complex number

 v) Addition of two complex numbers

 vi) Multiplication of two complex numbers (Note: represent complex number using a structure.)

Week 8:

21. i) Write a C program which copies one file to another.

 ii) Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line.)

22. i) Write a C program to display the contents of a file.

 ii) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Week 9:

23. Write a C program that uses functions to perform the following operations on singly linked list:

i) Creation   ii)Insertion   iii)Deletion   iv)Traversal

Week 10:

24. Write C programs that implement stack (its operations) using

    i) Arrays   ii)Pointers

25. Write C programs that implement Queue (its operations) using

    i) Arrays   ii)Pointers

Week 11:

26. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

    i) Bubble sort ii) Selection sort

Week 12:

27. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:

    i) Linear search   ii) Binary search

TEXTBOOKS
1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, 3rd Edition, Cengage Learning.
2. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education
3. Head First C, David Griffiths, Dawn Griffiths, O'reilly Publications 2012.

REFERENCES
1. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
2. C: The Complete Reference by Herbert Schildt, 4th Edition, TMH
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
4. Learn to Code with C : The MagPi Essentials by Simon Long
5. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 5th Edition, Pearson Education.
6. Let Us C: Authentic Guide to C Programming Language by Yashvanth P. Kanetkar

DATABASE MANAGEMENT SYSTEMS LAB

MCA I Year I Sem   **L   T   P   C**
                                                                          0   0   2   1

Co-requisites

1. Co-requisite of course "Database Management Systems"

Objectives
1. Introduce ER data model, database design and normalization
2. Learn SQL basics for data definition and data manipulation

Outcomes
1. Design database schema for a given application and apply normalization
2. Acquire skills in using SQL commands for data definition and data manipulation. Develop solutions for database applications using procedures, cursors and triggers

List of Experiments:-
1. Conceptual design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.)
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

Textbooks
1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, 3rd Edition Tata McGraw Hill
2. Database System Concepts, Silberschatz, Korth,, 7th edition, McGraw hill.

References
1. Database Systems Design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, ElmasriNavrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

JAVA PROGRAMMING

MCA I Year II Sem   **L   T   P   C**
                                                                                           3   0   0   3

Prerequisites:
1. A course on "Computer Programming & Data Structures"

Objectives:
1. Introduces object oriented programming concepts using the Java language.
2. Introduces the principles of inheritance and polymorphism; and demonstrates how they relate to the design of abstract classes
3. Introduces the implementation of packages and interfaces
4. Introduces exception handling, event handling and multithreading
5. Introduces the design of Graphical User Interface using applets and swings

Outcomes:
1. Develop applications for a range of problems using object-oriented programming techniques
2. Design simple Graphical User Interface applications

UNIT - I
Object Oriented Thinking and Java Basics: Need for OOP paradigm, summary of OOP concepts, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, using final with variables, garbage collection, overloading methods and constructors, recursion, nested and inner classes, exploring string class.

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 and methods, polymorphism- method overriding, abstract classes, the Object class.
Packages: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT - III
Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.
Exception Handling: Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. String handling,

UNIT - IV
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. Handling menus, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.
Swing: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons –

The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

UNIT - V
Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.
Multithreading: Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter-thread communication, thread groups.

TEXTBOOKS
1. Java the complete reference, Herbert schildt, 7th editon, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, pearson edition.

REFERENCES
1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley& sons.
2. An Introduction to OOP, T. Budd, 3rd edition, pearson education.
3. Introduction to Java programming, Y. Daniel Liang, pearson education.
4. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary
6. Cornell, 8th Edition, Pearson Education.
7. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and   Gary Cornell, 8th Edition, Pearson Education
8. Object Oriented Programming with Java, R.Buyya,S.T.Selvi,X.Chu,TMH.
9. Java and Object Orientation, an introduction, John Hunt, 2nd edition, Springer.
10. Maurach's Beginning Java2 JDK 5 , SPD.
11. Programming and Problem Solving with Java, JM Slack, B S Publications.

OPERATING SYSTEMS

MCA I Year II Sem   L   T   P   C
                                                                     3   0   2* 4

Prerequisites:
1. Computer Programming and Data Structures
2. A good knowledge of C programming language
3. Fundamental concepts of Computer Organization and Architecture.

Objectives:
1. To learn various concepts and issues related to Operating systems
2. To learn the underlying issues in the design of an operating system.

Outcomes:
1. Appreciate all features of an operating system.
2. Recognize and address various issues of an operating system.
3. Gains knowledge of interaction among Programming Languages, operating systems and their architecture.

UNIT - I
Operating System Introduction: Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls.

UNIT - II
Process and CPU Scheduling: Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling.
System call interface for process management: fork, exit, wait, waitpid, exec

UNIT - III
Deadlocks: System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.
Process Management and Synchronization: The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors.
Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT - IV
Memory Management and Virtual Memory: Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT - V
File System Interface and Operations: Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

TEXTBOOKS

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix Environment, W.R.Stevens, Pearson education.

REFERENCES
1. Operating Systems – Internals and Design Principles Stallings, 5th Edition–2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 2nd edition, Pearson/PHI
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Unix Internals The New Frontiers, U.Vahalia, Pearson Education.

OPERATING SYSTEMS LAB

MCA I Year II Sem

Prerequisites:
1. A course on "Computer Organization and Architecture".

Co-requisite:
1. A course on "Operating Systems".

Objectives:
1. To provide an understanding of the design aspects of operating system concepts through simulation
2. Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

Outcomes:
1. Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
2. Able to implement C programs using Unix system calls

List of Experiments:

1. Write C programs to simulate the following CPU Scheduling algorithms

   a) FCFS   b) SJF   c) Round Robin   d) priority

2. Write programs using the I/O system calls of UNIX/LINUX operating system

   (open, read, write, close, fcntl, seek, stat, opendir, readdir)

3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.

4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.

5. Write C programs to illustrate the following IPC mechanisms

   a) Pipes   b) FIFOs   c) Message Queues   d) Shared Memory

6. Write C programs to simulate the following memory management techniques

   a) Paging   b) Segmentation

TEXT BOOKS

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, *Pearson* education.
3. Operating system concepts : Milan Milenkovik (TMH Publication)

REFERENCE BOOKS

1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–

2005, Pearson Education/PHI
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

COMPUTER NETWORKS

MCA I Year II Sem

L T P C
3 0 0 3

Objectives
1. The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
2. Familiarize the students with the standard models that use the layered approach for facilitating communication between machines in a network
3. The protocols that support communication in computer network standards.

Outcomes
1. Gain the knowledge of the basic computer network technology.
2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of subnetting and routing mechanisms.
4. Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

UNIT - I
Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.
Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

UNIT - II
Data link layer: Design issues, framing, Error detection and correction.
Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.
Sliding Window protocols: one-bit sliding window protocol, a protocol using Go-Back-N, a protocol using Selective Repeat, Example data link protocols.
Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT - III
Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT - IV
Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

UNIT - V
Application Layer: Domain name system, SNMP, Electronic Mail, World Wide Web, HTTP, Streaming audio and video.

TEXTBOOK
1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education

REFERENCES
1. DataCommunicationsandNetworking–BehrouzA.Forouzan.5th Edition, TMH.
2. Computer Networking: Top-down Approach – Kurose and Ross, 6th Edition, Pearson Education

DATA MINING

MCA I Year II Sem   **L   T   P   C**
                                                                         3   0   2* 4

Prerequisites:

1. A course on "Database Management Systems"

Course Objectives:

1. Introduce the concepts, principles and techniques related to Data Mining

Course Outcomes:

1. Understand the strengths and limitations of various data mining techniques like classification, association rule mining, cluster analysis and outlier detection.

UNIT-I
Introduction- What is Data Mining? What Kinds of Data Can Be Mined? What Kinds of Patterns Can Be Mined? Which Technologies are Used? Which Kinds of Applications are Targeted? Major Issues in Data Mining

Data Preprocessing- Overview, Data Cleaning-Missing Values, Noisy Data, Data Reduction-Attribute Subset Selection, Data Transformation and Data Discretization-Data Transformation by Normalization, Discretization by Binning

UNIT-II
Association Rule Mining- Market Basket Analysis, Frequent Itemsets, Closed Itemsets and Association Rules, Apriori Algoritm, Generating Association Rules from Frequent Itemsets

Classification-Basic Concepts, Decision Tree Induction, Bayes Classification Methods, k-Nearest Neighbor Classifiers, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy

UNIT-III
Cluster Analysis- What is Cluster Analysis, Requirements for Cluster Analysis, Overview of Basic Clustering Methods, k-Means, k-Medoids, Agglomerative vs. Divisive Hierarchical Clustering

UNIT-IV
Outlier Detection-Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches, Clustering Based Approaches and Classification-Based Approaches

UNIT-V
Text Mining: Text Data Analysis and Information Retrieval, Dimensionality Reduction for Text, Text Mining Approaches

Mining the WWW: Mining the Web Page Layout Structure, Mining the Web's Link Structures, Mining Multimedia Data on the Web, Automatic Classification of Web Documents, Web Usage Mining

TEXTBOOKS:
1. Data Mining- Concepts and Techniques- Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann Publication

2. Data Mining- Concepts and Techniques- Second Edition, Jiawei Han, Micheline Kamber, Morgan Kaufmann Publication

REFERENCES:

1. Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, Mark A. Hall, The Morgan Kaufmann Publication, 2011
2. R for Data Science, Hadley Wickham & Garrett Grolemund, O'Reilly, 2017

DATA MINING WITH R PROGRAMMING LAB

MCA I Year II Sem

Co-Requisite:
1. Course on "Datamining"

Objectives:

1. In this course student will learn how to program in R, and learn how to use R for Data mining

Outcomes:

1. Acquire the ability to do statistical computing in R
2. Acquire the ability to do data mining using R

List of Experiments:

1. Apply Descriptive statistics on AUTO MPG Data Set (download from UCI Repository).

2. Consider your class result data and analyze the performance of students in each subject at 1st quantile (25%), 2nd quantile (50%) and 3rd quantile (75%).

3. Apply Linear Regression by extracting mpg and displacement from AUTO MPG Data Set. Consider mpg as dependent variable and displacement as independent variable.

4. Apply Multiple Regression by extracting mpg, cylinders, displacement, horsepower, weight, acceleration attributes from the AUTO MPG Data set, consider acceleration as dependent variable and remaining all are independent variables.

5. Consider the Indian Liver Patient Dataset (download from UCI Repository) divide the data set into training set and test set based on 75%:25%, train KNN model based on training set and generate confusion matrix based on test set.

6. Consider IRIS data set from UCI Repository divide it into training set and test set by applying sample techniques and train Decision tree on training set and generate confusion matrix based on test set.

7. Apply Random forest tree on Indian Liver Patient Dataset (download from UCI Repository) and generate confusion matrix and also compare accuracies of training and test of KNN and Random Forest Tree.

8. Apply K-Means Clustering algorithm on bag of words (download from UCI Repository).

9. Apply Hierarchical Clustering algorithm on bag of words (download from UCI Repository)

SOFTWARE ENGINEERING

MCA I Year II Sem
        L T P C
        3 0 2* 4

Objectives:
1. The aim of the course is to provide an understanding of the working knowledge of the techniques for requirements elicitation analysis, estimation, design, testing and quality management of large software development projects.
2. Have knowledge about various process models, software process/product metrics, risk management, quality management and UML diagrams

Outcomes:
1. Demonstrate the ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
2. Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
3. Will have experience and/or awareness of testing problems and will be able to develop a simple test cases and test report.

UNIT - I
Introduction to Software Engineering: The nature of software, changing nature of software, The software process, The Process Framework, Umbrella Activities, Process Adaptation, Software Engineering Practice, The Essence of Practice, General Principles software development myths.
Software process structure: A Generic Process Model, defining a Framework Activity, Identifying a Task Set, Process Patterns, Process Assessment and Improvement.
Process models: Prescriptive Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Specialized Process Models: Component-Based Development, The Formal Methods Model, Aspect-Oriented Software Development, The Unifi ed Process: A Brief History, Phases of the Unifi ed Process, Personal and Team Process Models: Personal Software Process, Team Software Process.

UNIT - II
Agile Software Development: Agile methods, Agile development techniques, Agile Project management, Scaling Agile methods.
Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.
Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.
System modeling: Context models, interaction models, structural models, behavioral models, model-driven architecture.

UNIT - III
Design Engineering: Design process and design quality, design concepts, the design model.
Creating an architectural design: software architecture, architectural styles, architectural

design, conceptual model of UML, basic structural modeling, use case diagrams, class diagrams, sequence diagrams, collaboration diagrams, component diagrams, deployment diagrams.

UNIT - IV
Software Testing Strategies: A strategic approach to software testing, test strategies for conventional software, test strategies for object-oriented software, black-box and white-box testing, validation testing, system testing, the art of debugging.
Product metrics: a framework for product metrics, metrics for the requirements model, metrics for the design model, metrics for source code, metrics for testing, metrics for maintenance.

UNIT - V
Metrics for Process and Products: Metrics in the Process and Project Domains, Software measurement, metrics for software quality.
Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.
Quality Management: Elements of Software Quality Assurance, SQA Processes and Product Characteristics, SQA Tasks, Goals, and Metrics, Formal Approaches to SQA, Statistical Software Quality Assurance, Software Reliability, The ISO 9000 Quality Standards, The SQA Plan.

TEXTBOOKS
1. Software Engineering, A practitioner's Approach- Roger S. Pressman, Bruce R. Maxim, 8th edition, McGraw-Hill International Edition.
2. Software Engineering- Sommerville, 10th edition, Pearson.
3. The unified modeling language user guide by Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

REFERENCES
1. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiely.
2. Software Engineering principles and practice - WamanSJawadekar, TheMcGraw-Hill Companies.
3. Fundamentals of object oriented design in UML, Meilir page-Jones: Pearson.

SOFTWARE ENGINEERING LAB

MCA I Year II Sem

Co-requisite:
1. A Course on "Software Engineering"

Objectives
1. To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Outcomes
1. Ability to translate end-user requirements into system and software requirements
2. Ability to generate a high level design of the system from the software requirements
3. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

Do the following 8 exercises for any two projects in the list of sample projects:

1) Development of problem statement.
2) Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3) Preparation of Software Configuration Management and Risk Management related documents.
4) Study and usage of any Design phase CASE tool.
5) Performing the Design by using any Design phase CASE tools.
6) Develop test cases for unit testing and integration testing.
7) Develop test cases for various white box and black box testing techniques.

Sample Projects:
1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system

TEXTBOOKS
1. Software Engineering, A practitioner's Approach- Roger S. Pressman, Bruce R. Maxim, 8th edition, McGrawHill International Edition.
2. Software Engineering- Sommerville, 10th edition, Pearson.
3. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

MOBILE APPLICATION DEVELOPMENT

MCA I Year II Sem
            L   T   P   C
            3   0   0   3

Prerequisites:
1. Acquaintance with JAVA programming
2. A Course on DBMS

Objectives:
1. To demonstrate the understanding of the fundamentals of Android operating systems
2. To improves the skills of using Android software development tools
3. To demonstrate the ability to develop software with reasonable complexity on mobile platform
4. To demonstrate the ability to deploy software to mobile devices
5. To demonstrate the ability to debug programs running on mobile devices

Outcomes:
1. Understand the working of Android OS Practically.
2. Acquires the skills to develop Android user interfaces
3. Develop, deploy and maintain the Android Applications.

UNIT - I
Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes

Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT - II
Android User Interface: Measurements – Device and pixel density independent measuring units Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT - III
Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT - IV
Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT - V
Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXT BOOKS

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCE BOOKS

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

MOBILE APPLICATION DEVELOPMENT LAB

MCA I Year II Sem
        L T P C

        0 0 2 1

Objectives
1. To learn how to develop Applications in android environment.
2. To learn how to develop user interface applications.
3. To learn how to develop URL related applications.

Objectives
1. Understands the working of Android OS Practically.
2. Acquire the skills to develop user interfaces.
3. Develop, deploy and maintain the Android Applications.

The student is expected to be able to do the following problems, though not limited.

1. Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialling a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.

11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.
13. Create an application that shows the given URL (from a text field) in a browser.
14. Develop an application that shows the current location's latitude and longitude continuously as the device is moving (tracking).
15. Create an application that shows the current location on Google maps.

Note:
Android Application Development with MIT App Inventor: For the first one week, the student is advised to go through the App Inventor from MIT which gives insight into the various properties of each component.
The student should pay attention to the properties of each component, which are used later in Android programming. Following are useful links:
1. http://ai2.appinventor.mit.edu
2. https://drive.google.com/file/d/0B8rTtW_91YclTWF4czdBMEpZcWs/view

TEXTBOOKS
1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

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

JAVA PROGRAMMING LAB

MCA I Year II Sem   **L   T   P   C**
                                                          0   0   2   1

Prerequisites

1. A course on "C and Data Structures"

Co-requisite:
1. A Course on "Object-Oriented Programming Through Java"

Objectives:
1. Introduces object oriented programming concepts using the Java language.
2. Introduces the principles of inheritance and polymorphism; and demonstrates how they relate to the design of abstract classes
3. Introduces the implementation of packages and interfaces
4. Introduces exception handling, event handling and multithreading
5. Introduces the design of Graphical User Interface using applets and swings

Outcomes:
1. Develop applications for a range of problems using object-oriented programming techniques
2. Design simple Graphical User Interface applications

1. Use Eclipse or Netbean platform and get acquainted with the various menus. Create a test project, add a test class and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

2. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea () that prints the area of the given shape.

3. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box. [Use JOption Pane –Input dialog, Message dialog]

4. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

5. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radiobuttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color. Initially, there is no message shown.

6. 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. Handle any possible exceptions like divide by zero

7. a. Develop an applet in Java that displays a simple message.
   b. Develop an applet in Java that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named "Compute" is clicked.

8. Write a Java program that handles all mouse events and shows the event name at the centre of the window when a mouse event is fired (Using Adapter classes).

9. Write a Java program that handles all keyboard events and shows the event name at the centre of the window when a mouse event is fired (Use Adapter classes).

TEXTBOOKS
1. Java Fundamentals – A comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.

REFERENCES
1. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education (OR) Java: How to Program P.J.Deitel and H.M.Deitel, PHI.
2. Object Oriented Programming through Java, P.Radha Krishna, Universities Press.

CYBER SECURITY

(Audit Course - I)

MCA I Year II Sem
       L   T   P   C
       2   0   0   0

Prerequisites: NIL

Objectives:
1. To familiarize various types of cyber-attacks and cyber-crimes.
2. To give an overview of the cyber laws
3. To study the defensive techniques against these attacks

Outcomes:
1. The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks

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

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, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT - IV

Cyber Security: Organizational Implications: Introduction cost of cyber crimes 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 dimensions of cyber crimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V
Cybercrime: Examples and Mini-Cases
Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.
Mini-Cases:
The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT 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.

REFERENCES
1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Cyber Security Engineering, A pratical approach for systems and software Assurance, Nancy R.Mead, Carol C.Woody, Pearson Education.

NETWORK ADMINISTRATION

MCA II Year I Sem   **L   T   P   C**

                                                                  3   0   2* 4

Prerequisites
1. Basic knowledge of computers, Operating System and Networking fundamentals with logical approach

Objectives
1. To train the students in networking, implementation, maintenance and administration
2. To provide skills in networking and prepare the students for a career in Network management and administration

Outcomes
1. Learn adding and creating user accounts and rights
2. Set-up and configure File servers, Networked nodes and Services
3. Troubleshoot Network issues
4. Maintain Network, Security and Accounting

UNIT - I
Setting up Your Environment: Getting started, Distributions to consider, Physical machines versus virtual machines, Setting up and configuring VirtualBox, Acquiring VirtualBox, Downloading and installing the Extension Pack, Acquiring and installing Debian 8, Acquiring and installing CentOS 7, **Revisiting Linux Network Basics:** Understanding the TCP/IP protocol suite, Naming the network device, Understanding Linux hostname resolution, Understanding the net-tools and iproute2 suites, Manually managing network interfaces, Managing connections with Network Manager

UNIT - II
Communicating Between Nodes via SSH: Using OpenSSH, Installing and configuring OpenSSH , connecting to network hosts via openssh-client, The OpenSSH config file, Understanding and utilizing scp Transferring files to another node via scp, Tunneling traffic via SSH, Generating public keys, Keeping SSH connections alive, Exploring an alternative to SSH – utilizing Mosh (mobile shell), **Setting up a File Server:** File server considerations, NFS v3 versus NFS v4 , Setting up an NFS server, Learning the basics of Samba Setting up a Samba server, Mounting network shares, Automatically mounting network shares via fstab and systemd, Creating networked filesystems with SSHFS

UNIT - III
Monitoring System Resources: Inspecting and managing processes, Understanding load average, Checking available memory, Using shell-based resource monitors, Scanning used storage, Introduction to logging, Maintaining log size with logrotate , Understanding the systemd init system, Understanding the systemd journal, **Configuring Network Services:** Planning your IP address layout, Installing and configuring a DHCP server, Installing and configuring a DNS server, Setting up an internal NTP server

UNIT - IV
Hosting HTTP Content via Apache: Installing Apache, Configuring Apache, Adding modules, Setting up virtual hosts, **Understanding Advanced Networking Concepts:** Dividing your network into subnets, Understanding the CIDR notation, Implementing Quality of Service, Routing TCP/IP traffic, Creating redundant DHCP and DNS servers

UNIT - V
Securing Your Network: Limiting the attack surface , Securing OpenSSH , Configuring the iptables firewall Protecting system services with fail2ban, Understanding SELinux, Configuring Apache to utilize SSL, Deploying security updates, **Troubleshooting Network Issues:** Tracing routing issues, Troubleshooting DHCP issues, Troubleshooting DNS issues, Displaying connection statistics with netstat, Scanning your network with Nmap and Zenmap, Installing missing firmware on Debian systems, Troubleshooting issues with Network Manager

TEXTBOOKS

1. Mastering Linux Network Administration, 2015 Packt Publishing, Packt Publishing,

2. Linux Network Administrator's Guide, 2nd Edition By Olaf Kirch & Terry Dawson 2nd Edition June 2000, Oreilly Publishers.

3. Unix the ultimate guide, sumithabha Das, TMH

4. Microsoft® Windows Server® 2008 Administration, STEVE SEGUIS, Mc Graw Hill.

5. Red Hat Enterprise Linux 6 Administration, Sander van Vugt, John wiley &sons.

REFERENCES

1. The Complete Reference Linux, Richard Petersen, Mc Graw Hill.

2. Maurice J. Bach, "Design of UNIX Operating System", PHI.

3. Linux system Administration, Tom Adelstein & Bill Lubanovic, Oreilly.

NETWORK ADMINISTRATION LAB

MCA II Year I Sem

Prerequisites:
1. Basic knowledge of computers, Operating System and Networking Fundamentals with logical approach

Objectives:
1. To train the students in networking, its implementation and administration
2. To provide skills in networking and its maintenance and equip the students to seek career in Network management and administration

Outcomes
1. Learn adding and creating user accounts and rights
2. Set-up and configure File servers, Networked nodes and Services
3. Troubleshoot Network issues
4. Maintain Network, security and accounting

Tasks:
1. Set-up and Configure a Virtual Machine and list out the specifications of various nodes in your machine.
2. Download and Install Linux OS (Ubuntu) and explore the details of disk configuration.
3. Study different network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
4. Study different network devices(Repeater, Hub, Switch, Bridge, Router and Gateway) and do installation and configurations of network devices.
5. Study the following networking and configuration commands:
   (Ping, TraceRoute, IPconfig, nslookup, wireshark, netstat)
6. Study various types of networks and connect two or more machines in LAN and Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration).
7. Study various network topologies and configure a Network topology using packet tracer software.
8. Study the basics of TCP/IP networking and configurations.
9. Install and configure OpenSSH and transfer files using scp.
10. Learn and practice the following commands: ps, top, htop, du, df
11. Learn IP addressing and install, configure the following servers: DHCP, DNS and explore the details practically.

WEB TECHNOLOGIES

MCA II Year I Sem   **L   T   P   C**

                                                                          3   0   0   3

Objectives:

   1.   To introduce PHP language for server side scripting

   2.   To introduce XML and processing of XML Data with Java

   3.   To introduce Server side programming with Java Servlets and JSP

   4.   To introduce Client side scripting with JavaScript

Outcomes:

   1.   Create dynamic web documents and implement and execute program

   2.   Implement an appropriate planning strategy for developing websites

   3.   Parse and use **XML** Data with Java

   4.   Implement Server side programming with Java Servlets and JSP

UNIT - I

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;
XML: Introduction to 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 - II

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 – III

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, and 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.

UNIT – IV

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 – V

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.

TEXTBOOKS

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

2.   The Complete Reference PHP — Steven Holzner, TataMcGraw-Hill

REFERENCES

1. Web Programming, building internet applications, Chris Bates, 2nd Edition, Wiley Dreamtech

2. Java Server Pages, Hans Bergsten, SPDO'Reilly,

3. Java Script, D. Flanagan, 6th Edition, O'ReillyMedia.

4. Beginning Web Programming-Jon DuckettWROX.

5. Programming World Wide Web, R.W.Sebesta, 4th Edition, Pearson.

6. Internet and World Wide Web — How to program, Dietel and Nieto, Pearson.

INTERNET OF THINGS

MCA II Year I Sem
                    L   T   P   C

                                                   3   0   2*   4

Objectives:
1. To introduce the terminology, technology and applications of Internet of Things
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To introduce the Python Scripting Language used in many IoT devices
4. To introduce the Raspberry PI platform, widely used in IoT applications
5. To introduce the implementation of web based services on IoT devices

Outcomes:

1. Interpret the impact and challenges posed by IoT networks leading to new architectural models.
2. Compare and contrast the deployment of smart objects and the technologies to connect them to network.
3. Appraise the role of IoT protocols for efficient network communication.
4. Elaborate the need for Data Analytics and Security in IoT.
5. Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

UNIT - I
Introduction to IOT: Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, Logical Design of IoT- IoT Functional Blocks, communication models and Communication APIs IoT enabling Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home Automation, Cities, Environment, Retail, Agriculture, Industry, Health and Lifestyle

UNIT - II
IoT and M2M – Software defined networks, Network Function Virtualization, Simple Network Management Protocol (SNMP), Network Operator requirements, NETCOZF, YANG-NETCONF, YANG, SNMP and Network Operator Requirements.

UNIT - III
Developing IOT: IoT Platforms Design Methodology, Case Study on IOT system for Weather Monitoring
Introduction to Python - Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages: JSON, XML, HTTP Lib, URL Lib & SMTP Lib

UNIT - IV
IoT Physical Devices and Endpoints - Introduction to Raspberry PI, Raspberry PI Interfaces (serial, SPI & I2C), Programming Raspberry PI with Python – Controlling LED with Raspberry PI , Interfacing an LED & switch and a Light sensor with Raspberry PI.

UNIT - V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs, Cloud for IoT, Python web application framework Designing a RESTful web API and Amazon Web services for IOT. **Case studies illustrating IOT design**- Home Automation, Agriculture

TEXTBOOKS

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

REFERENCES

1. Internet of Things: Architecture, Implementation and Security, Mayur Ramgir, Pearson India Education Services Pvt.Ltd, 2020, ISBN 978-93-534-3894-4
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

INTERNET OF THINGS (IoT) LAB

MCA II Year I Sem

Objectives
1. To introduce the raspberry PI platform, that is widely used in IoT applications
2. To introduce the implementation of distance sensor on IoT devices
3. To introduce how to use IOT in different domains like Home Automation, Agriculture etc.

Outcomes
1. Implement M2M (machine to machine) protocols and get awareness in implementation of distance sensor
2. Program using python scripting language used in many IoT devices
3. Do Home Automation, Smart Irrigation and detecting Fire accidents in Forests and Air pollution.

List of Experiments

1. Using raspberry pi
   a)   Calculate the distance using distance sensor.
   b)   Implement basic LED functionality.
2. Using Arduino
   a)   Calculate the distance using distance sensor.
   b)   Implement basic LED functionality.
   c)   Calculate temperature using temperature sensor.
3. Home Automation
   a)   Smart Lighting
   b)   Home Intrusion Detection
4. Smart Irrigation in Agriculture Domain
5. Forest fire detection
6. Air pollution Detection

TEXTBOOKS
1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Internet of Things: Architecture, Implementation and Security, Mayur Ramgir, Pearson India Education Services Pvt.Ltd, 2020, ISBN 978-93-534-3894-4
3. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

CLOUD APPLICATIONS
(Professional Elective- I)

MCA II Year I Sem
        L T P C
        3 0 0 3

Prerequisites

1. A course on "Computer Networks"

Objectives

1. This course provides an insight into cloud computing applications
2. This course provides a step-by-step approach to understand, design, develop, test and deploy the applications for cloud

Outcomes

1. Understand various service delivery models, services in Cloud computing
2. Understand the ways in which the cloud applications can be designed, developed, tested and deployed.

UNIT- I

Introduction to Cloud: Definition of Cloud computing, Four Cloud Deployment Models, Cloud Services (IaaS, SaaS, PaaS)

Cloud Native- Cloud Native applications, drivers moving to cloud applications, Cloud development and deployment, 12-factor app, Micro service adoption

UNIT - II

Cloud Native applications – Core concepts using Micro services, Spring boot for Micro service application development, Designing Cloud Native applications- Role of API gateways, Micro service design guidelines, Design and Development patterns

UNIT - III

Testing Cloud Native applications – Test cases before development, Testing patterns, Types of Testing, Testing the product service

UNIT - IV

CLOUD Native application Deployment - Deployment models, Deployment Patterns

Cloud Native application runtime – The need for a runtime, Implementing runtime reference architecture, Container orchestration, Platform as a Service(PaaS)

UNIT – V

Platform Deployment – AWS platform, AWS platform Deployment options, Azure platform, Azure platform deployment options

TEXTBOOKS

1. Cloud-Native Applications in Java Shyam Sundar & Munish Kumar Gupta & Ajay Mahajan Shyam Sundar
2. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011

3. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCES

1. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
2. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011

INFORMATION RETRIEVAL SYSTEMS
(Professional Elective - I)

MCA II Year I Sem

L	T	P	C
3	0	0	3

Prerequisites:

1. Data Structures

Objectives:

1. To learn the important concepts and algorithms in IRS

2. To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems

Outcomes:

1. Apply IR principles to locate relevant information in large collections of data

2. Design different document clustering algorithms

3. Implement retrieval systems for web search tasks.

4. Design an Information Retrieval System for web search tasks.

UNIT - I
Introduction: Motivation, Basic Concepts, Past-Present and Future, the Retrieval Process
Modelling: Introduction, A Taxonomy of Information retrieval Models, Retrieval: Ad hoc and Filtering, A Formal Characteristics of IR Models, Classic Information Retrieval, Alternative Set Theory Models, Alternative Probabilistic Models, Structured Text Retrieval Models, Model for Browsing

UNIT - II
Retrieval Evaluation: Introduction, retrieval Performance Evaluation, Reference Collections
Query languages: Introduction, Keyword-Based Querying, Pattern Matching, Structural Queries, Query Protocols
Query Operations: Introduction, User Relevance Feedback, Automatic Local Analysis, Automatic global Analysis
Text Operations: Introduction, Document Preprocessing, Document Clustering, Text Compression, Comparing text Compression Techniques

UNIT - III
Indexing and Searching: Introduction, Inverted Files, Other Indices for Text, Boolean queries, Sequential Searching, pattern Matching, Structural Queries, Compression
Searching the Web: Introduction, Challenges, Characterizing the Web, Search Engines, Browsing, Metasearches, Finding the Needle in the Haystack, Searching using Hyperlinks

UNIT - IV
User Interfaces and Visualization: Introduction, human-Computer Interaction, The Information Access Process, Starting Points, Query Specification, Context, User Relevance Judgments, Interface Support for the Search Process

UNIT - V
Multimedia IR: Models and Languages Introduction, Data Modeling, Query Languages Multimedia IR: Indexing and Searching.
Introduction, Background-Spatial Access Methods, A Generic Multimedia Indexing Approach, One Dimensional Time Series, two dimensional Color Images, Automatic Feature Extraction

TEXT BOOKS
1.   Modern Information Retrieval, Yates and Neto, 1st Edition, Pearson Education.

REFERENCES

1.   Information Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark T Maybury, Kluwer Academic Press, 1997.

2.   Information Retrieval Data Structures and Algorithms, Frakes, W.B., Ricardo Baeza-Yates, Prentice Hall, 1992.

3.   Information Storage & Retieval, Robert Korfhage – John Wiley & Sons.

INFORMATION SYSTEMS AUDIT AND CONTROL
(Professional Elective – I)

MCA II Year I Sem   **L   T   P   C**

                                                                           3   0   0   3

Objectives:
4. To train the students in the areas of Information systems
5. To train the students in the procedures adopted for control and audit applied in information systems
6. To train the students in IS Audit Management

Outcomes:
2. Appreciate the concepts related to information systems.
3. Appreciates various frameworks in information systems.
4. Understand concepts of IS Audit Management.

UNIT - I
The Management Control Framework: Overview of Information Systems and Auditing, Top Management controls, Systems Development Management controls, Programming Management controls, Concepts of Data Resource management controls, security Management controls and quality Assurance Management controls.

UNIT - II
The Application control Framework: Boundary Controls, Input controls, communication controls, concepts of Processing controls, data base Controls and Output controls.

UNIT - III
Evidence Collection: Audit software, Code Review, Test Data and Code comparison. Concurrent Auditing Techniques

UNIT - IV
Evidence evaluation: Evaluating Asset Safeguarding and Data integrity, Evaluating System Effectiveness, Evaluating System Efficiency.

UNIT - V
Information Systems Audit Management: Managing the Information Systems Audit Functions

TEXTBOOKS

1. Information Systems Control and Audit – Ron Weber – Pearson Education Inc. ISBN 978-81-317-0472-1

DESIGN AND ANALYSIS OF ALGORITHMS
(Professional Elective - I)

MCA II Year I Sem   **L   T   P   C**

                                                         3   0   0   3

Prerequisites:

1. A course on "Computer Programming and Data Structures"
2. A course on "Advanced Data Structures"

Objectives:

1. Introduces the notations for analysis of the performance of algorithms.
2. Introduces the data structure disjoint sets.
3. Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
4. Describes how to evaluate and compare different algorithms using worst-, average-, and best-case analysis.
5. Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Outcomes

1. Analyze the performance of algorithms
2. Choose appropriate data structures and algorithm design methods for a specified application
3. Understand how the choice of data structures and the algorithm design methods impact the performance of programs

UNIT – I
Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and little oh notation. Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT - II
Disjoint Sets: Disjoint set operations, union and find algorithms Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph coloring

UNIT – III
Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

UNIT – IV
Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT – V

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and 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.

TEXTBOOKS

1. Fundamentals of Computer Algorithms, Ellis Horowitz,Satraj Sahni and Rajasekharan, University Press.

REFERENCES

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education.
2. Introduction to Algorithms, second edition,T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons

MOBILE COMPUTING
(Professional Elective - II)

MCA II Year I Sem   **L   T   P   C**

                                                                   3   0   0   3

Prerequisites:
1. A course on Computer Networks

Objectives:
1. To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
2. To understand the typical mobile networking infrastructure through a popular GSM protocol
3. To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
4. To understand the database issues in mobile environments & data delivery models.
5. To understand the ad hoc networks and related concepts.
6. To understand the platforms and protocols used in the mobile environment.

Outcomes:
1. Develop new mobile application.
2. Give solutions to any technical issue related to mobile computing paradigm
3. Develop new ad hoc network applications and/or algorithms/protocols.
4. Understand & develop any existing or new protocol related to the mobile environment

UNIT - I
Introduction
Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.
GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS

UNIT - II
(Wireless) Medium Access Control (MAC)
Motivation for a specialized MAC (Hidden and exposed terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)
Mobile Network Layer
IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT - III
Mobile Transport Layer
Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

Database Issues

Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models

UNIT - IV
Data Dissemination and Synchronization
Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods.

UNIT - V
Mobile Ad hoc Networks (MANETs)
Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, Mobile Agents, Service Discovery.

TEXT BOOKS
1. Jochen Schiller, "Mobile Communications", Addison-Wesley, 2nd Edition, 2009.
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772

SOFTWARE TESTING METHODOLOGIES
(Professional Elective - II)

MCA II Year I Sem

L T P C

3 0 0 3

Prerequisites
1. A course on "Software Engineering"

Objectives

1. To provide knowledge about various concepts in software test planning, test cases design, test execution and various testing methodologies.

2. To develop skills in software test automation and management using latest tools.

Outcomes
1. Design and develop the best testing strategies in accordance to the development model.

UNIT - I
Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.
Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT - II
Transaction Flow Testing: transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.
Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT - III
 Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.
Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT - IV
State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT - V
Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

TEXTBOOKS

1. Software testing techniques – BarisBeizer, 2nd edition, Dreamtech.

2. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.

REFERENCES

1. The craft of software testing - Brian Marick, Pearson Education.

2. Software Testing Techniques –SPD(Oreille)

3. Software Testing in the Real World – Edward Kit, Pearson.

4. Effective methods of Software Testing, Perry, JohnWiley.

5. Art of Software Testing – Meyers, JohnWiley.

BIOMETRICS
(Professional Elective - II)

MCA II Year I Sem

L	T	P	C
3	0	0	3

Objectives:

1. To learn the face, fingerprint, iris, hand, gait, voice recognition techniques in biometric technologies.

2. To learn the feature extraction techniques in biometric systems.

Outcomes:

1. Understand the biometric technologies of Face recognition, Retina, Iris.

2. Understand gait recognition, voice recognition technologies

3. Understand and extract biometric features using feature extraction, tokenization techniques

UNIT – I
Introduction to Biometrics, operation of a biometric system, verification vs identification, Applications, biometric characteristics
Fingerprint recognition – sensing, feature extraction, matching

UNIT - II
Face recognition – eigen faces, fisherfaces, LDA, DLDA, EBGM, tensorfaces, Advanced correlation features, Active appearance models for face recognition, face super resolution using locality preserving projections.

UNIT - III
Iris recognition – Active contours, flexible generalized embedded coordinates, fourier-based trigonometry, detecting and excluding eyelashes.
Hand geometry recognition – introduction, applications, processing steps, challenges.

UNIT - IV
Gait recognition – the HumanID gait challenge problem, Baseline gait algorithm, recognition approaches
The ear as a biometric – evidences and support to ear as a biometric, forensic ears, PCA, force field transform, acoustic ear recognition.

UNIT - V
Voice biometrics – technology, identity information in the speech signal, feature extraction and tokenization, text-dependent speaker recognition, text-independent speaker recognition

TEXTBOOKS

1. Anil.K.Jain, Arun. A.Ross and Patric Flynn, "Handbook of biometrics", Springer, 2008.

2. Anil.K.Jain, Arun A.Ross, Karthik Nandanavanam, "Introduction to biometrics", Springer, 2011.

E-COMMERCE

(Professional Elective – II)

MCA II Year I Sem

L	T	P	C
3	0	0	3

Objectives:

1. Identify the major categories and trends of e-commerce applications.

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

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

6. Discuss the various marketing strategies for an online business.

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

Outcomes:

1. Identify the business relationships between the organizations and their customers

2. Perform various transactions like payment, data transfer and etc.

UNIT - I
Electronic Commerce-Frame work, 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
Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management

UNIT - III
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
Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogue, Information Filtering
Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing's, Desktop video conferencing

UNIT – IV

Web Marketing Strategies, Communicating with Different Market Segments, Beyond Market Segmentation: Customer Behavior and Relationship Intensity, Advertising on the Web, E- Mail Marketing, Search Engine Positioning and Domain Names, Selling to Businesses Online, Electronic Data Interchange, Supply Chain Management Using Internet Technologies, Electronic Marketplaces and Portals

UNIT - V

E-Business Revenue Models, Revenue Models for Online Business, Changing Strategies: Revenue Models in Transition, Revenue Strategy Issues for Online Businesses, Creating an Effective Business Presence Online, Web Site Usability, Virtual Communities, Mobile Commerce, Online Auctions

TEXTBOOK

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson. (UNITS 1, 2, 3)

2. E-Business by Gary P. Schneider, - Cengage India Learning (UNITS 4, 5)

REFERENCES

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, John Wiley.

2. E-Commerce, S. Jaiswal – Galgotia.

3. E-Commerce, Efrain Turbon, Jae Lee, David King, H. Michael Chang.

4. Electronic Commerce – Gary P. Schneider – Thomson.

5. E-Commerce – Business, Technology, Society, Kenneth C. Taudon, Carol Guyerico Traver.

WEB TECHNOLOGIES LAB

MCA II Year I Sem   **L T P C**

                                                                    0 0 2 1

Co-requisites:

1. A course on "Web Technologies"

Objectives:

1. To provide hands-on experience on web technologies
2. To introduce client-server application development using web technologies
3. To give exposure to Client side programming using HTML,CSS and Java Script
4. To introduce server side programming with Java servlets and JSP

Outcomes

1. Design and develop interactive and dynamic web applications using HTML, CSS, JavaScript and XML
2. Create websites with static and dynamic web pages.
3. Apply client-server principles to develop scalable and enterprise web applications.

List of Experiments:

1. Write a PHP script to print prime numbers between 1-50.
2. 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.
3. Write a PHP script to merge two arrays and sort them as numbers, in descending order.
4. Write a PHP script that reads data from one file and write into another file.
5. Develop static pages (using Only HTML) of an online book store. The pages should resemble: www.amazon.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
6. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
7. 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.
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.
9. Redo the previous task using JSP by converting the static web pages of assignments 2 into 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.

ARTIFICIAL INTELLIGENCE
(Audit Course - II)

MCA II Year I Sem   **L   T   P   C**

                                                        2   0   0   0

Objectives:

1. To learn the distinction between optimal reasoning Vs. human like reasoning
2. To understand the concepts of state space representation, solving problems by searching
3. To learn different knowledge representation techniques.
4. To understand the applications of AI, namely theorem proving, and machine learning.

Outcomes:

1. Possess the skill for solving problems by searching.
2. Possess the skill for representing knowledge using the appropriate technique for a given problem.
3. Ability to represent knowledge in uncertain domains.
4. Possess the ability to apply AI techniques to solve problems of theorem proving, and machine learning.

UNIT –I
Introduction: Introduction to AI, Intelligent Agents
Problem Solving by Searching-I: Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search

UNIT – II
Problem Solving by Searching-II
Informed (Heuristic) Search Strategies: Hill-climbing search, A* search, Heuristic Functions.
Constraint Satisfaction Problems:
Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs.

UNIT - III
Logic and Knowledge Representation
Propositional Logic:
Knowledge-Based Agents, The Wumpus World, Propositional Logic, Inference and proofs, Horn clauses and definite clauses, Forward and backward chaining , Agents Based on Propositional Logic.
First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic

Knowledge Representation:
Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories

UNIT - IV
Uncertain knowledge and Learning Uncertainty
Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Baye's Rule and Its Use
Probabilistic Reasoning:
Representing Knowledge in an Uncertain Domain, the Semantics of Bayesian Networks

UNIT - V
Learning
Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees.
Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning.

TEXTBOOKS
1. Artificial Intelligence A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson Education.

REFERENCES
1. Artificial Intelligence, 3^{rd}Edn. , E.Rich and K.Knight(TMH)
2. Artificial Intelligence, 3^{rd}Edn. Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

MACHINE LEARNING
(Professional Elective - III)

MCA II Year II Sem
L T P C
3 0 0 3

Prerequisites:

1. Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques; knowledge of Digital Signal Processing is desirable.

Objectives:

1. This course introduces fundamental concepts, theories, and algorithms for pattern recognition and machine learning.
2. Topics include: Pattern Representation, Nearest Neighbor Based Classifier, Bayes Classifier, Hidden Markov Models, Decision Trees, Support Vector Machines, Clustering, and an application of hand-written digit recognition.

Outcomes:

1. Understand the theory, benefits, inadequacies and possible applications of various machine learning and pattern recognition algorithms
2. Identify and employ suitable machine learning techniques in classification, pattern recognition, clustering and decision problems

UNIT - I
Introduction: What is Pattern Recognition, Data Sets for Pattern Recognition, and Different Paradigms for Pattern Recognition
Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering

UNIT - II
Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

UNIT - III
Hidden Markov Models: Markov Models for Classification, Hidden Morkov Models, Classification using HMMs. Decision Trees: Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

UNIT - IV
Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for

Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

UNIT - V

Clustering: Why is Clustering Important, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-Hand Written Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

TEXTBOOK

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Spinger Pub,1st Ed.

REFERENCES

1. Machine Learning - Mc Graw Hill, Tom M. Mitchell.
2. Fundamentals of Speech Recognition: Lawrence Rabiner and Biing- Hwang Juang. Prentice-Hall Pub.

BLOCKCHAIN TECHNOLOGY
(Professional Elective - III)

MCA II Year II Sem

	L	T	P	C
	3	0	0	3

Objectives:

1. Give an introduction to block chain technology and Cryptocurrency

Outcomes:

1. Learn about research advances related to one of the most popular technological areas today.

UNIT- I
Introduction

Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowd funding

UNIT- II
Extensibility of Blockchain concepts

Digital Identity verification, Block chain Neutrality, Digital art, Blockchain Environment

UNIT- III
Blockchain Science

Grid coin, Folding coin, Blockchain Genomics, Bitcoin MOOCs

UNIT - IV
Currency

Token, Tokenizing, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT - V
Technical challenges

Business model challenges, Scandals and Public perception, Government Regulations

TEXTBOOKS

1. Blockchain Blue Print for Economy by Melanie Swan, O'REILLY publications.

REFERENCES

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps, 1st ed. by Daniel Drescher

BIG DATA ANALYTICS
(Professional Elective - III)

MCA II Year II Sem

L	T	P	C
3	0	0	3

Objectives:

1. To provide an understanding of the core concepts in Big Data
2. To introduce common Big Data technologies

Outcomes:

1. Understand frameworks such as Hadoop, MapReduce, Apache Spark and NoSQL distributed databases.

UNIT - I
Types of Digital Data-Classification of Digital Data, Introduction to Big Data, Big Data Analytics

UNIT - II
The Big Data Technology Landscape, Introduction to Hadoop

UNIT - III
Introduction to MongoDB, Introduction to MaP Reduce programming

UNIT - IV
Introduction to Hive, Introduction to Pig

UNIT - V
Introduction to Machine Learning, Overview of Spark-How Spark fits into the Big Data Ecosystem, Spark Model of Parallel Computing, Spark Job Scheduling, and The Anatomy of a Spark Job (Text Book 2)

TEXTBOOKS

1. Big Data and Analytics, 2ed by Seema Acharya & Subhashini Chellappan, Wiley, 2019
2. High Performance Spark: Best Practices for Scaling and Optimizing Apache Spark, Holden Karau & Rachel Warren, O'REILLY, 2017

REFERENCES

1. Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Chris Eaton, Dirk deroos et al., McGraw Hill, 2017
2. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, Wiley, 2012.

VIRTUAL AND AUGMENTED REALITY
(Professional Elective - III)

MCA II Year II Sem

               L T P C

               3 0 0 3

UNIT - I

VIRTUAL REALITY AND VIRTUAL ENVIRONMENTS: The historical development of VR: Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality. HARDWARE TECHNOLOGIES FOR 3D USER INTERFACES: Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces.

UNIT - II

3D USER INTERFACE INPUT HARDWARE: Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interfaces.

UNIT- III

SOFTWARE TECHNOLOGIES: Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market

UNIT - IV

3D INTERACTION TECHNIQUES: 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Deign Guidelines - 3D Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations of Wayfinding, User Centered Wayfinding Support, Environment Centered Wayfinding Support, Evaluating Wayfinding Aids, Design Guidelines - System Control, Classification, Graphical Menus, Voice Commands, Gestrual Commands, Tools, Mutimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry.
DESIGNING AND DEVELOPING 3D USER INTERFACES: Strategies for Designing and Developing Guidelines and Evaluation.
VIRTUAL REALITY APPLICATIONS: Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.

UNIT - V

Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

TEXT BOOKS:

1. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.
2. Designing Virtual Systems: The Structured Approach, Gerard Jounghyun Kim, 2005.
3. 3D User Interfaces, Theory and Practice, Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, Addison Wesley, USA, 2005.
4. Spatial Augmented Reality: Meging Real and Virtual Worlds, Oliver Bimber and Ramesh Raskar, 2005.
5. Virtual Reality Technology, Burdea, Grigore C and Philippe Coiffet, Wiley Inter science, India, 2003.
6. Virtual Reality Systems, John Vince, Addison Wesley, 1995.
7. Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society, Howard Rheingold, Simon and Schuster, 1991.
8. Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics), William R Sherman and Alan B Craig, Morgan Kaufmann Publishers, San Francisco, CA, 2002
9. Understanding Augmented Reality, Concepts and Applications, Alan B. Craig, Morgan Kaufmann, 2013.

<h1 style="text-align:center">OPTIMIZATION TECHNIQUES</h1>
<h2 style="text-align:center">(Open Elective - I)</h2>

MCA II Year II Sem   **L   T   P   C**

                                                            3   0   0   3

Objectives:

1. This course explains various optimization problems and the techniques to address those problems.
2. To study linear programming, dynamic programming and optimization techniques etc.
3. To understand the theory of games.

Outcomes:

1. Gain the knowledge of optimization techniques
2. Apply Optimization techniques to address the real time problems.

UNIT – I
Introduction
Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications
Allocation
Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

UNIT – II
Transportation Problem
Formulation – Optimal solution, unbalanced transportation problem – Degeneracy
Assignment problem
Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem

UNIT - III
Sequencing
Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines
Replacement
Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT - IV
Theory Of Games
Introduction –Terminology– Solution of games with saddle points and without saddle points- 2x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.
Inventory
Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

UNIT - V
Waiting Lines
Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.
Dynamic Programming
Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem

TEXTBOOKS

1. Operation Research, J.K.Sharma, MacMilan.
2. Introduction to O.R, Taha, PHI

REFERENCES

1. Operations Research: Methods and Problems, Maurice Saseini, Arhur Yaspan and Lawrence Friedman
2. Operations Research, A.M.Natarajan, P.Balasubramaniam, A. Tamilarasi, Pearson Education.
3. Operations Research, Wagner, PHI Publications.
4. Introduction to O.R, Hillier, Libermann, TMH.

CYBER LAWS
(Open Elective - I)

MCA II Year II Sem

	L	T	P	C
	3	0	0	3

Objectives:

1. The objectives of this course are to enable the learner to understand, explore, and acquire a critical understanding of cyber laws.
2. Equip the learner with competencies for dealing with frauds and deceptions, and other cyber crimes that take place via the Internet

Outcomes:

1. Understand the social and intellectual property issues emerging from cyberspace.
2. Understand the policy regulations of cyber space employed by various countries
3. Understand the relationship between commerce and cyberspace.
4. Gain the knowledge of Information Technology Act

UNIT - I
Conceptual and theoretical perspective of Cyber Law, Computer and Web Technology, Development of Cyber Law, National and International Perspective Cyber Law, Legal issues and challenges in India, USA, Data Protection, Cyber Security.

UNIT - II
Jurisdiction issues in Transactional Crimes Cyber Law, International Perspective, Budapest Convention on Cybercrime. Hacking and Legal Issues, Privacy legal issues

UNIT - III
Cyber Law and IPR, Understanding Copyright in Information Technology, Software Copyrights Copyright in Internet & Multimedia, Software Piracy, Trademarks in Internet Domain Name registration, Domain Name disputes, Icann's core principles and domain names, Net Neutrality, Databases in IT, Protection of databases, Position in USA, EU and India.

UNIT - IV
E-Commerce, UNCITRAL Model, Legal Aspects of E-Commerce, E-Taxation, E-Banking, Online Publishing and online credit card payment, Employment Contracts, Non-Disclosure Agreements.

UNIT - V
Information Technology Act 2000, Aims and Objectives, Overview of the Act, Jurisdiction, Electronic Governance, Electronic Evidence, Digital Signature Certificates, Digital Signatures, Duties of Subscribers, Role of Certifying Authorities, Regulations Appellate Tribunal, Internet Service Providers and their liabilities, Social Networking Sites.

TEXTBOOKS

1. Law Relating to Computer, Internet and E-Commerce by Kamath Nandan, 5th Edition,Universal Law Publishing.

REFERENCES

1. Cyber Laws by Kamath Nandan,.
2. CyberLaw Text & Casesby Gerald R. Ferrera, Reder et.al, 3rd Edition, Cengage Learning.
3. Cyber Law in India by Faroug Ahmed, 3rdEdition, New Era Law Publication.
4. Hand book of Cyber Laws by Vakul Sharma.

MANAGEMENT INFORMATION SYSTEMS
(Open Elective - I)

MCA II Year II Sem　　　　　　　　　　　　　　　　**L　T　P　C**

　　　　　　　　　　　　　　　　　　　　　　　　　3　0　0　3

Objectives

1. To introduce Information Systems Models

2. Topics include types of Information Systems, ERP Modules etc.,

Outcomes

1. Understand different types of information systems

2. Gain good knowledge of ERP Modules and ERP Implementation and Maintenance.

UNIT - I
Introduction to IS Models: Nolan Stage Hypothesis, IS Strategic Grid, Wards Model, Earl's Multiple Methodology, Critical Success Factors, Soft Systems Methodology, Socio-Technical Systems Approach (Mumford), System Develop Life Cycle, Prototype and End User Computing, Application Packages, Outsourcing, Deciding Combination of Methods.

UNIT - II
Types of Information Systems: Transactions Processing System, Knowledge Work Systems, Office Automation System, Management Information System, Decision Support System, Expert System, Strategic Information System. IS Security, Control and Audit - System Vulnerability and Abuse, business value of security and control, Need for Security, Methods of minimizing risks, IS Audit, ensuring system quality.

UNIT - III
Induction to ERP: Overview of ERP, MRP, MRPII and Evolution of ERP, Integrated Management Systems, Reasons for the growth of ERP, Business Modeling, Integrated Data Model, Foundations of IS in Business, Obstacles of applying IT. Advantages and limitations of ERP

UNIT - IV
ERP Modules: Finance, Accounting Systems, Manufacturing and Production Systems, Sales and Distribution Systems, , Human Resource Systems, Plant Maintenance System, Materials Management System, Quality Management System, ERP System Options and Selection, ERP proposal Evaluation.

UNIT - V
ERP Implementation and Maintenance: Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to Attain Success, User Training, Maintaining ERP & IS. Case Studies

TEXTBOOKS
1. Information systems for modern management, 3rd Edition by R.G Murdick, J.E Ross and J. R clagget, PHI-1994.

REFERENCES

1. C Laudon and Jane P.Laudon, et al: Management Information Systems, Pearson Education, 2009.
2. Alexis Leon, ERP (Demystified), 5/E, Tata McGraw-Hill, 2009.
3. David L Olson, Managerial Issues of Enterprise Resource Planning Systems, McGraw Hill, International Edition-2009.
4. Vaman, ERP in Practice, Tata McGraw-Hill , 2009
5. Gordon B. Davis & Margrethe H.Olson: Management Information Systems, Tata McGraw-Hill , 2009.
6. W S Jawadekar: Management Information Systems, Tata McGraw-Hill , New Delhi, 2009
7. James A. Obrein: Management Information Systems, Tata McGraw-Hill , 2008
8. Gerald V.Post, David L Anderson: Management Information Systems, Irvin McGraw Hill, 2009.

ENTREPRENEURSHIP
(Open Elective - I)

MCA II Year II Sem

L T P C

3 0 0 3

Objectives:

1. The aim of this course is to have a comprehensive perspective of inclusive learning, ability to learn and implement the fundamentals of Entrepreneurship.

Outcomes:

1. Learn the basics of Entrepreneurship and entrepreneurial development which will help them to provide vision for their own Start-up.

UNIT - I
Entrepreneurial Perspectives

Introduction to Entrepreneurship – Evolution - Concept of Entrepreneurship - Types of Entrepreneurs - Entrepreneurial Competencies,Capacity Building for Entrepreneurs. Entrepreneurial Training Methods

- Entrepreneurial Motivations - Models for Entrepreneurial Development - The process of Entrepreneurial Development.

UNIT - II
New Venture Creation

Introduction, Mobility of Entrepreneurs, Models for Opportunity Evaluation; Business plans – Purpose, Contents, Presenting Business Plan, Procedure for setting up Enterprises, Central level - Startup and State level - T Hub, Other Institutions initiatives.

UNIT - III
Management of MSMEs and Sick Enterprises

Challenges of MSME s, Preventing Sickness in Enterprises – Specific Management Problems; Industrial Sickness; Industrial Sickness in India – Symptoms, process and Rehabilitation of Sick Units

UNIT - IV
Managing Marketing and Growth of Enterprises

Essential Marketing Mix of Services, Key Success Factors in Service Marketing, Cost and Pricing, Branding, New Techniques in Marketing, International Trade.

UNIT - V
Strategic perspectives in Entrepreneurship

Strategic Growth in Entrepreneurship, The Valuation Challenge in Entrepreneurship, The Final Harvest of New Ventures, Technology, Business Incubation, India way – Entrepreneurship; Women Entrepreneurs – Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India.

TEXTBOOKS

1. Entrepreneurship Development and Small Business Enterprises, Poornima

M.Charantimath, 2nd edition, Pearson, 2014.

2. Entrepreneurship, a South – Asian Perspective, D.F.Kuratko and T.V.Rao, 3rd edition, Cengage, 2012.

3. Entrepreneurship, Arya Kumar, 4th edition, Pearson 2015.

4. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2015.