COMMON SYLLABUS FOR BACHELOR IN COMPUTER APPLICATIONS (BCA)

Preamble

There are various innovative technologies that have come up in the IT world which are transforming the business landscape at a rapid pace. The challenges of the IT sector today are a lot different from those that existed a few years ago. The changing technological environment has made it necessary for students who aspire to a career in IT to be well aware of the latest innovations. The BCA program is specially designed to cater to the present industry skills and knowledge needs. It comprises of theoretical and practical training sessions that can prepare students for the well-rewarding jobs of the future.

Programme Details

- The programme is designed keeping in mind the needs of the industry. It comprises of subjects that are relevant to the current technological environment.

- Develop strong fundamental knowledge in core IT subjects such as C Programming, Computer Organization and Data Structures

- Learn the basics of programming in Java, Web Technology and Database Systems

- Get a chance to work on projects that give better exposure to current industry

CHOICE BASED CREDIT SYSTEM (CBCS): The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in Odisha. This will benefit the students to move across institutions within Odisha to begin with and across states and countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student’s performance in examinations, the UGC has formulated the guidelines to be followed.

PROGRAMME LEARNING OUTCOMES

The Bachelor in Computer Applications (BCA) programme enables students to attain, by the time of graduation:

- Ability to apply knowledge of computing appropriate to the discipline.
- Ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- Ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.
• Ability to function effectively on teams to accomplish a common goal.
• Understanding of professional, ethical, legal, security and social issues and responsibilities.
• Ability to communicate effectively with a range of audiences.
• Ability to analyze the local and global impact of computing on individuals, organizations, and society.
• Recognition of the need for an ability to engage in continuing professional development.
• Ability to use current techniques, skills, and tools necessary for computing practice.
• Ability to apply algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
• Ability to apply design and development principles in the construction of software systems of varying complexity.

OUTLINE OF CHOICE BASED CREDIT SYSTEM

1. Core Course: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. Elective Course: Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate’s proficiency/skill is called an Elective Course.

2.1 Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

2.2 Dissertation/Project: An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.

2.3 Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.

P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.
GUIDELINES FOR PROJECT FORMULATION

As the project work constitutes a major component in most of the professional programs and it is to be carried out with due care and should be executed with seriousness by the candidates.

TYPE OF PROJECT

As majority of the students are expected to work out a real-life project in some industry/research and development laboratories/educational institutions/software companies, it is suggested that the project is to be chosen which should have some direct relevance in day-to-day activities of the candidates in his/her institution. It is not mandatory for a student to work on a real-life project. The student can formulate a project problem with the help of Guide.

PROJECT PROPOSAL (SYNOPSIS)

The project proposal should be prepared in consultation with the guide. The project proposal should clearly state the project objectives and the environment of the proposed project to be undertaken. The project work should compulsorily include the software development. The project proposal should contain complete details in the following form:

1. Title of the Project
2. Introduction and Objectives of the Project
3. Project Category (RDBMS/OOPS/Networking/Multimedia/Artificial Intelligence/Expert Systems etc.)
4. Analysis (DFDs at least up to second level, ER Diagrams/ Class Diagrams/ Database Design etc. as per the project requirements).
5. A complete structure which includes: Number of modules and their description to provide an estimation of the student’s effort on the project. Data Structures as per the project requirements for all the modules. Process Logic of each module. Testing process to be used. Reports generation
6. Tools / Platform, Hardware and Software Requirement specifications
7. Future scope and further enhancement of the project.
# BACHELOR IN COMPUTER APPLICATIONS (BCA)

Effective from 2019-20 Academic Session

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**CORE Papers:**

CORE – 1: Digital Logic
CORE – 2: Programming Using C
CORE – 3: Programming Using C++
CORE – 4: Data Structure
CORE – 5: Computer Organization
CORE – 6: Java Programming
CORE – 7: Discrete Mathematical Structures
CORE – 8: Operating System
CORE – 9: Computer Networks
CORE – 10: Database Systems
CORE – 11: Web Technologies
CORE – 12: Software Engineering
CORE – 13: Computer Graphics
CORE – 14: Numerical Techniques

Discipline Specific Electives (DSE) Papers:

DSE–1: Unix Shell Programming
DSE–2: Data Mining
DSE–3: Data Science
DSE–4: Project Work / E-Commerce

Skill Enhancement Courses (SEC):

SEC – 1: Python Programming
SEC – 2: Android Programming

Ability Enhancement Courses (AEC): (Credit: 02 each)

AEC – 1: Environmental Science.
AEC – 2: English/MIL Communication

Generic Elective (GE)/ InterdisciplinaryCourse (IC):

GE/IC – 1: Principles of Management
GE/IC – 2: Statistics
GE/IC – 3: Business Accounting
GE/IC – 4: Business Economics
DETAILED SYLLABUS

CORE–1: DIGITAL LOGIC

OBJECTIVES

- To understand different methods used for the simplification of Boolean functions and binary arithmetic.
- To design and implement combinational circuits, synchronous & asynchronous sequential circuits.
- To study in detail about Semiconductor Memory Systems.

Unit-1


Unit-2


Unit-3


Unit-4

Memory System: Semiconductor RAM Memories, Internal Organization of Memory Chips, Static Memories, Asynchronous DRAMS, Synchronous DRAMS, Structure of Large Memories, Memory System Considerations, RAMBUS Memory. Read-Only Memories:

Text Books:


Reference Books:


CORE–2 PRACTICAL: DIGITAL LOGIC LAB

1. Introduction to Xilinx software (VHDL)

Write the VHDL code for

2. Realizing all logic gates.

3. Combination Circuit.

4. ADDER.

5. SUBTRACTOR.

6. MUX.

7. DE-MUX.

8. Encoder.


10. PAL.

11. PLA.

Write the VHDL program for the following Sequential Logic Circuits

12. Flip Flops.

13. Shift Registers.


15. Memory Elements.

CORE–2: PROGRAMMING USING C

OBJECTIVES:

- To learn basics of C programming language.
To be able to develop logics to create programs/applications in C.

Unit-1
Introduction: Introduction to Programming Language, Introduction to C Programming, Keywords & Identifiers, Constants, Variables, Input and Output Operations, Compilation and pre-processing, Data types: Different data types, Data types qualifier, modifiers, Memory representation, size and range, Operators: Operators (Arithmetic, Relational, Logical, Bitwise, Assignment & compound assignment, Increment & Decrement, Conditional), Operator types (unary, binary, ternary). Expressions, Order of expression (Precedence and associativity)
Control structures: Decision Making and Branching (Simple IF Statement, IF...ELSE Statement, Nesting IF...ELSE Statement, ELSE IF Ladder), Selection control structure (Switch Statement).

Unit-2
Loops: The WHILE Statement, The DO...WHILE Statement, The FOR Statement, Jumps in Loops, Array: Concept of Array, Array Declaration, types of array (one and multiple dimension), Character Arrays and Strings, Subscript and pointer representation of array, Array of Pointers, Limitation of array, Pointers: Concept of Pointer (null pointer, wild pointer, dangling pointer, generic pointer), Pointer Expressions, Accessing the Address of a Variable, Declaring Pointer Variables, Initializations of Pointer Variable, Accessing a Variable through its Pointer, Pointer arithmetic.

Unit-3
Storage class: Types (auto, register, static, extern), scope rules, declaration and definition. Function: Function & types (User defined function, library function) Function Definition, Declaration, Function Calls, Header file and library, Function Arguments, string handling function (strlen, strcmp, strcpy, strncpy, strcat, strstr), Function recursion, Functions Returning Pointers, Pointers to Functions, Command line arguments, Application of pointer (dynamic memory allocation).

Unit-4
Structure and Union: Defining, Declaring, Accessing, Initialization Structure, nested structure, self-referential structure, bit-field, Arrays of Structures, Structures and Functions, Unions, difference between structure and union, active data member, structure within union, Self-referential Structure.
File: File Management in C, Defining and Opening a File, File opening modes (read, write, append), Closing a File, File operations, file and stream, Error Handling During I/O Operations, sequential and random access file, low level and high level file.

Text Books:
1. E. Balagurusamy, “Programming in ANSI C”, 4/e, (TMH)

Reference Books:
1. B. Kernighan & Dennis Ritchie, “The C Programming Language”, 2/e PHI
Core-2 Practical: Programming Using C Lab
1. Write a Program to find greatest among three numbers.
2. Write a Program to all arithmetic operation using switch case.
3. Write a Program to print the sum and product of digits of an integer.
4. Write a Program to reverse a number.
5. Write a Program to compute the sum of the first n terms of the following series
   \[ S = 1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\ldots \]
6. Write a Program to compute the sum of the first n terms of the following series
   \[ S = 1-\frac{1}{2}+\frac{3}{4}-\frac{5}{6}+\ldots \]
7. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
8. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
9. Write a Program to compute the factors of a given number.
10. Write a program to swap two numbers using macro.
11. Write a Program to print a triangle of stars as follows (take number of lines from user):
    *  
    ***  
    *****  
    ******
12. Write a Program to perform following actions on an array entered by the user:
    a) Print the even-valued elements
    b) Print the odd-valued elements
    c) Calculate and print the sum and average of the elements of array
    d) Print the maximum and minimum element of array
    e) Remove the duplicates from the array
    f) Print the array in reverse order
   The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.
13. Write a Program that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
14. Write a program that swaps two numbers using pointers.
15. Write a program in which a function is passed address of two variables and then alter its contents.
16. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
17. Write a program to find sum and average of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions.
18. Write a menu driven program to perform following operations on strings:
    a) Show address of each character in string
    b) Concatenate two strings without using strcat function.
    c) Concatenate two strings using strcat function.
    d) Compare two strings
    e) Calculate length of the string (use pointers)
    f) Convert all lowercase characters to uppercase
    g) Convert all uppercase characters to lowercase
    h) Calculate number of vowels
    i) Reverse the string
19. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
20. Write a program to copy the content of one file to other.
CORE-3: PROGRAMMING USING C++

OBJECTIVES

- To know about the Object Oriented Programming concepts.
- To learn basics of C++ programming language.
- To be able to develop logics to create programs/ applications in C++.

Unit-1
Principles of Object-Oriented Programming: Object-Oriented Programming (OOP) Paradigm, Basic Concepts of OOP, Benefits of OOP, Characteristics of OOPS, Object Oriented Languages, Applications of OOP.
Introduction to C++, Difference between C & C++, Tokens, Data types, Operators, Structure of C++ Program, C++ statements, Expressions and Control Structures.

Unit-2
Classes and Objects: Defining Member Functions, Making an outside Function Inline, Nested Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions.
Constructors & Destructors: Constructors, Parameterized Constructors, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructors, Destructors.

Unit-3
Inheritance: Basics of Inheritance, Type of Inheritance, Virtual Base Classes, Abstract Classes, Member Classes, Nesting of Classes. Polymorphism: Pointers, Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions, Function Overloading, Operator Overloading.

Unit-4
Managing Console I/O Operations: C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators.

Text Books
1. E. Balgurusawmy, Object Oriented Programming with C++, 4/e (TMH).
2. Paul Deitel, Harvey Deitel, "C++: How to Program", 9/e. Prentice Hall.

Reference Books:
1. Bjarne Stroustrup, Programming - Principles and Practice using C++, 2/e, Addison-Wesley 2014

CORE–3 PRACTICAL: PROGRAMMING USING C++ LAB
1. Write a Program to find greatest among three numbers using nested if…else statement.
2. Write a Program to check a number is prime or not.
3. Write a Program to find the GCD and LCM of two numbers.
4. Write a program to print the result for following series: 1! + 2! + 3! + …………
5. Write a program to print multiplication table from 1 to 10.
6. Write a Program for Swapping of two numbers using pass by value.
7. Write a Program for Swapping of two numbers using pass by address.
8. Write a Program for Swapping of two numbers using pass by reference.
9. Write a Program to find sum of four numbers using default argument passing.
10. Write a Program to find square and cube of a number using inline function.
11. Write a Program to find the factorial of a number.
12. Write a Program to find reverse of a number.
13. Write a program to find sum of four numbers using default argument passing in member function.
14. Write a Program to find area of circle, triangle and rectangle using function overloading.
15. Write a program to distinguish the properties of static and non-static ata members.
16. Write a program to show the method of accessing static private member function.
17. Write a program to show the ways of calling constructors and destructors.
18. Write a program to perform ++ operator overloading using member function.
19. Write a program to perform ++ operator overloading using friend function.
20. Write a program to perform + operator overloading for two complex number addition.
21. Write a program to perform + operator overloading for string concatenation.
22. Write a program to perform single inheritance.
23. Write a program to perform multiple inheritance.
24. Write a program to create an integer array using new operator and find the sum and average of array elements.
25. Write a program to implement virtual destructor.
26. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
27. Write a program to Copy the contents of one file to other.

CORE–4: DATA STRUCTURE
OBJECTIVES

- To learn how the choice of data structures impacts the performance of programs.
- To study specific data structures such as arrays, linear lists, stacks, queues, hash tables, binary trees, binary search trees, heaps and AVL trees.
- To learn efficient searching and sorting techniques.

Unit-1

Introduction: Basic Terminology, Data structure, Time and space complexity, Review of Array, Structures, Pointers.

Linked Lists: Dynamic memory allocation, representation, Linked list insertion and deletion, Searching, Traversing in a list, Doubly linked list, Sparse matrices.

Unit-2

Stack: Definition, Representation, Stack operations, Applications (Infix–Prefix–Postfix Conversion & Evaluation, Recursion).

Queues: Definition, Representation, Types of queue, Queue operations, Applications.

Unit-3

Trees: Tree Terminologies, General Tree, Binary Tree, Representations, Traversing, BST, Operations on BST, Heap tree, AVL Search Trees, M-way search tree, Applications of all trees.

Unit-4

Sorting: Exchange sorts, Selection Sort, Bubble sort, Insertion Sorts, Merge Sort, Quick Sort, Radix Sort, Heap sort.

Searching: Linear search, Binary search.

Text book

REFERENCES

CORE – 4 PRACTICAL: DATA STRUCTURE LAB
Write a C/ C++ Program for the followings

1. To insert and delete elements from appropriate position in an array.
2. To search an element and print the total time of occurrence in the array.
3. To delete all occurrence of an element in an array.
4. Array implementation of Stack.
5. Array implementation of Linear Queue.
6. Array implementation of Circular Queue.
7. To implement linear linked list and perform different operation such as node insert and delete, search of an item, reverse the list.
8. To implement circular linked list and perform different operation such as node insert and delete.
9. To implement double linked list and perform different operation such as node insert and delete.
10. Linked list implementation of Stack.
11. Linked list implementation of Queue.
12. Polynomial representation using linked list.
13. To implement a Binary Search Tree.
14. To represent a Sparse Matrix.
15. To perform binary search operation.
16. To perform Bubble sort.
17. To perform Selection sort.
18. To perform Insertion sort.
19. To perform Quick sort.
20. To perform Merge sort.

CORE–5: COMPUTER ORGANIZATION

OBJECTIVES

- To study the basic organization of digital computers (CPU, memory, I/O, software).
- To have a better understanding and utilization of digital computers.
- To be familiar with Assembly Language Programming (ALP)

Unit-1
Basic Structure of Computers: Computer Types, Functional Units, Input Unit, Memory Unit, Arithmetic and Logic Unit, Output Unit, Control Unit, Basic Operational Concepts, Bus Structures, Software, Machine Instructions and Programs: Numbers, Arithmetic Operations, and Characters: Number Representation, Addition of Positive Numbers, Addition and Subtraction of Signed Numbers, Overflow of Integer Arithmetic, Floating-Point Numbers & Operations, Characters, Memory Locations and Addresses, Byte Addressability, Word Alignment, Accessing Numbers, Characters, and Character Strings, Memory Operations, Instructions and Instruction Sequencing, Register Transfer Notation, Basic Instruction Types, Instruction Execution and Straight-Line Sequencing, Branching, Condition Codes, Generating Memory Addresses, Addressing Modes, Implementation of Variables and Constants, Indirection and Pointers, Indexing and Arrays, Relative Addressing.
Unit-2

Unit-3

Unit-4

Text Books

Reference Books

CORE-5PRACTICAL: COMPUTER ORGANIZATION LAB

1. Study of the complete Architecture of 8085 Microprocessor along with its instruction set.
2. Introduction to GNU Simulator 8085, with its features.
3. Write an Assembly Language Program to add N consecutive numbers.
4. Write an Assembly Language Program to find the smallest and largest number from a given series.
5. Write an Assembly Language Program for subtraction of two 8-bit numbers.
6. Write an Assembly Language Program for displaying a Rolling message “Hello 123”.

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7. Write an Assembly Language Program to perform ASCII to Decimal conversion.

8. Write an Assembly Language Program to add two unsigned binary numbers.

9. Write an Assembly Language Program to subtraction of two unsigned binary numbers.

CORE – 6: JAVA PROGRAMMING

OBJECTIVES

1. To learn the fundamentals of Object Oriented Programming in Java environment.
2. To learn the use of Java language and the Java Virtual Machine.
3. To write simple Java programming applications.

Unit-1
Introduction to Java: Java History, Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords (super, this, final, abstract, static, extends, implements, interface), Data Types, Wrapper class, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods). Input through keyboard using Command line Argument, the Scanner class, BufferedReader class.

Unit-2

Unit-3
Unit-4
Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

Text Books:
1. E. Balagurusamy, “Programming with Java”, TMH, 4/Ed,

Reference books:

CORE – 6PRACTICAL: JAVA PROGRAMMING LAB
1. To find the sum of any number of integers entered as command line arguments.
2. To find the factorial of a given number.
3. To convert a decimal to binary number.
4. To check if a number is prime or not, by taking the number as input from the keyboard.
5. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
6. Write a program that show working of different functions of String and StringBuffer classes like setCharAt( ), setLength( ), append( ), insert( ), concat( ) and equals( ).
7. Write a program to create a “distance” class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
8. Modify the “distance” class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
9. Write a program to show that during function overloading, if no matching argument is found, then Java will apply automatic type conversions (from lower to higher data type)
10. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword.
11. Write a program to show the use of static functions and to pass variable length arguments in a function.
12. Write a program to demonstrate the concept of boxing and unboxing.
13. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
14. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.
15. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
16. Write a program – “DivideByZero” that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.

20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).

21. Write a program to demonstrate priorities among multiple threads.

22. Write a program to demonstrate different mouse handling events like mouseClicked( ), mouseEntered( ), mouseExited( ), mousePressed( ), mouseReleased( ) & mouseDragged( ).

23. Write a program to demonstrate different keyboard handling events.

CORE – 7: DISCRETE MATHEMATICAL STRUCTURES

OBJECTIVES

- To learn the mathematical foundations for Computer Science.
- Topics covered essential for understanding various courses.

**Unit-1**

**Logics and Proof:** Propositional Logic, Propositional Equivalences, Predicates and Quantifiers Nested Quantifiers, Rules inference, Mathematical Induction.

**Sets and Functions:** Sets, Relations, Functions, Closures of Equivalence Relations, Partial ordering well ordering, Lattice, Sum of products and product of sums principle of Inclusions and Exclusions

**Unit-2**

**Combinatory:** Permutations, Combinations, Pigeonhole principle

**Recurrence Relation:** Linear and Non-linear Recurrence Relations, Solving Recurrence Relation using Generating Functions.

**Unit-3**

**Graphs:** Introduction to graphs, graphs terminologies, Representation of graphs, Isomorphism,

**Connectivity & Paths:** Connectivity, Euler and Hamiltonian Paths, Introduction to tree, tree traversals, spanning tree and tree search: Breadth first search, Depth first search, cut-set, cut-vertex.

**Unit-4**

**Modeling Computation:** Finite State Machine, Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA), Grammars and Language, Application of Pumping Lemma for Regular Language.

**Text Books:**

**Reference Books:**

**CORE – 7 PRACTICAL: DISCRETE MATHEMATICAL STRUCTURES LAB**

**Write the following programs using C/ C++**
1. Tower of Hanoi
2. Graph representation using Adjacency List.
3. Graph representation using Adjacency Matrix.
5. Detecting whether a number is even or odd using Finite State Machine.
6. To identify keywords such as char, const, continue using Finite State Machine.
7. To find the power set for a given set.
8. To find GCD of two numbers using recursion.
9. To find Binomial coefficients.
10. To find Permutation and Combination result for a given pair of values n and r.
11. To check a number is prime or not.
12. To calculate the Euclidean distance between two points.
13. To find the Roots of polynomials.
14. Find the shortest path pair in a plane.

**CORE–8: OPERATING SYSTEM**

**OBJECTIVES**

- To understand Operating system structure and services.
- To understand the concept of a Process, memory, storage and I/O management.

**Unit–1**
Introduction to Operating System, System Structures: Operating system services, system calls, system programs, Operating system design and implementation, Operating system structure.

**Unit–2**

**Unit-3**

**Unit–4**

**Text book:**

**Reference book:**
2. Richard F Ashley, Linux with Operating System Concepts, Chapman and Hall/CRC Published August 26, 2014
3. Richard Blum, Linux Command Line and Shell Scripting Bible, O’ Reilly

**CORE-8 PRACTICAL: OPERATING SYSTEM LAB**

1. Write a program (using *fork()* and/or *exec()* commands) where parent and child execute:
   a) same program, same code.
   b) same program, different code.
   c) before terminating, the parent waits for the child to finish its task.
2. Write a program to report behavior of Linux kernel including kernel version, CPU type and model. (CPU information)
3. Write a program to report behavior of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
4. Write a program to print file details including owner access permissions, file access time, where file name is given as argument.
5. Write a program to copy files using system calls.
6. Write a program using C to implement FCFS scheduling algorithm.
7. Write a program using C to implement Round Robin scheduling algorithm.
8. Write a program using C to implement SJF scheduling algorithm.
9. Write a program using C to implement non-preemptive priority based scheduling algorithm.
10. Write a program using C to implement preemptive priority based scheduling algorithm.
11. Write a program using C to implement SRTF scheduling algorithm.
12. Write a program using C to implement first-fit, best-fit and worst-fit allocation
CORE – 9: COMPUTER NETWORKS

OBJECTIVES

- To learn how do computers and terminals actually communicate with each other.
- To understand the parts of a communication network and how they work together.

Unit-1

Unit-2

Unit-3

Unit-4

Text Books:
1. Data Communications and Networking, Fourth Edition by Behrouz A. Forouzan, TMH.

Reference Books:

CORE – 9 PRACTICAL: COMPUTER NETWORKS LAB

Use C/C++/ any Network Simulator

1. Simulate Even Parity generator and checker.
2. Simulate two dimensional Parity generator and checker.
3. Simulate checksum generator and checker.
4. Simulate Hamming code method.
5. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
6. Simulate and implement stop and wait protocol for noisy channel.
7. Simulate and implement go back n sliding window protocol.
8. Simulate and implement selective repeat sliding window protocol.

CORE-10: DATABASE SYSTEMS

OBJECTIVES

- To learn the fundamental elements of database system.
- To learn the basic concepts of relational database management systems.
- To learn various SQL commands.

Unit-1


Unit-2

Database Design Theory and Normalization: Functional Dependencies, Normal Forms based on Primary Keys, Second and third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

Unit-3

Relational data Model and SQL: Relational Model Concepts, Basic SQLs, SQL Data Definition and Data types, Constraints in SQL, Retrieval Queries in SQL, INSERT, DELETE, UPDATE Statements in SQL, Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Binary Relation: JOIN and DIVISION.

Unit-4


Text Book:

Reference Book:

1. An Introduction to Database System, Date C. J. - Pearson Education, New Delhi - 2005

CORE-10 PRACTICAL: DATABASE SYSTEMS LABS

Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>NULL KEY</th>
<th>DEFAULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eno</td>
<td>Char(3)</td>
<td>NO</td>
<td>PRI</td>
</tr>
<tr>
<td>Ename</td>
<td>Varchar(50)</td>
<td>NO</td>
<td>NIL</td>
</tr>
<tr>
<td>Job_type</td>
<td>Varchar(50)</td>
<td>NO</td>
<td>NIL</td>
</tr>
<tr>
<td>Manager</td>
<td>Char(3)</td>
<td>Yes</td>
<td>FK</td>
</tr>
<tr>
<td>Hire_date</td>
<td>Date</td>
<td>NO</td>
<td>NIL</td>
</tr>
<tr>
<td>Dno</td>
<td>Integer</td>
<td>YES</td>
<td>FK</td>
</tr>
<tr>
<td>Commission</td>
<td>Decimal(10,2)</td>
<td>YES</td>
<td>NIL</td>
</tr>
<tr>
<td>Salary</td>
<td>Decimal(7,2)</td>
<td>NO</td>
<td>NIL</td>
</tr>
</tbody>
</table>

DEPARTMENT Schema

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>NULL KEY</th>
<th>DEFAULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dno</td>
<td>Integer</td>
<td>No</td>
<td>PRI</td>
</tr>
<tr>
<td>Dname</td>
<td>Varchar(50)</td>
<td>Yes</td>
<td>NULL</td>
</tr>
<tr>
<td>Location</td>
<td>Varchar(50)</td>
<td>Yes</td>
<td>New Delhi</td>
</tr>
</tbody>
</table>

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than Rs.2850.
6. Query to display Employee Name and Department Number for the Employee No= 7900.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of Rs.1500 and Rs.2850.
8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Query to display Name and Hire Date of every Employee who was hired in 1981.
10. Query to display Name and Job of all employees who don’t have a current Manager.
11. Query to display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Query to display Name of all the employees where the third letter of their name is ‘A’.
14. Query to display Name of all employees either have two ‘R’s or have two ‘A’s in their name and are either in Dept No = 30 or their Mangers Employee No = 7788.
15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Query to display the Current Date.
17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
18. Query to display Name and calculate the number of months between today and the date each employee was hired.
19. Query to display the following for each employee <E-Name> earns <Salary> monthly but wants <3*Current Salary>. Label the Column as Dream Salary.
20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with ‘J’, ‘A’ and ‘M’.
21. Query to display Name, Hire Date and Day of the week on which the employee started.
22. Query to display Name, Department Name and Department No for all the employees.
23. Query to display Unique Listing of all Jobs that are in Department # 30.
24. Query to display Name, Department Name of all employees who have an ‘A’ in their name.
25. Query to display Name, Job, Department No. and Department Name for all the employees working at the Dallas location.
26. Query to display Name and Employee no. Along with their Manager’s Name and the Manager’s employee no; along with the Employees Name who do not have a Manager.
27. Query to display Name, Department No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies Rs100.
29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees.
30. Query to display the number of employees performing the same Job type functions.
31. Query to display the no. of managers without listing their names.
32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33. Query to display Name and Hire Date for all employees in the same dept. as Blake.
34. Query to display the Employee No. And Name for all employees who earn more than the average salary.
35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a ‘T’.
36. Query to display the names and salaries of all employees who report to King.
37. Query to display the department no, name and job for all employees in the Sales department.

CORE – 11: WEB TECHNOLOGY

OBJECTIVES
To learn the fundamentals of web designing.
To design and develop standard and interactive web pages.
To learn some popular web scripting languages.

Unit 1
Web Essentials: Clients, Servers and Communication:
The Internet – Basic Internet protocols – The WWW, HTTP request message – response message, web clients web servers – case study.
Introduction to HTML: HTML, HTML domains, basic structure of an HTML document – creating an HTML document, mark up tags, heading, paragraphs, line breaks, HTML tags. Elements of HTML, working with text, lists, tables and frames, working with hyperlink, images and multimedia, forms and controls

Unit 2
Introduction to cascading style sheets: Concepts of CSS, creating style sheet, CSS properties, CSS styling (background, text format, controlling fonts), working with the block elements and objects. Working who lists and tables, CSS ID and class. Box model (introduction, border properties, padding properties, margin properties), CSS colour, groping, Dimensions, display, positioning, floating, align, pseudo class, Navigation bar, image sprites.

Unit 3
Java scripts: Client side scripting, what is java script, simple java script, variables, functions, conditions, loops and repetitions. Java scripts and objects, java script own objects, the DOM and web browser environment, forms and validations. DHTML: Combining HTML, CSS, java scripts, events and buttons, controlling your browser.

Unit 4
PHP: Starting to script on server side, PHP basics, variables, data types, operators, expressions, constants, decisions and loop making decisions. Strings – creating, accessing strings, searching, replacing and formatting strings. Arrays: Creation, accessing array, multidimensional arrays, PHP with Database.

Text Book:
2. Matt Doyle, Beginning PHP 5.3 (wrox-Willey publishing)
3. John Duckett, Beginning HTML, XHTML, CSS and Java script.

Reference Book:
1. HTML, XHTML and CSS Bible, 5ed, Willey India- Steven M. Schafer.

CORE – 11 PRACTICAL: WEB TECHNOLOGY LAB

1. Acquaintance with elements, tags and basic structure of HTML files.
2. Practicing basic and advanced text for formatting.
3. Practice use of image, video and sound in HTML documents.
5. Practicing Hyperlink of web pages, working with frames.
6. Working with forms and controls.
7. Acquaintance with creating style sheet, CSS properties and styling.
8. Working with background, text, font, list properties.
9. Working with HTML elements box properties in CSS.
10. Develop simple calculator for addition, subtraction, multiplication and division operation using java script.
11. Create HTML page with java script which takes integer number as a input and tells whether the number is odd or even.
12. Create HTML page that contains form with fields name, Email, mobile number, gender, favorite colour and button; now write a java script code to validate each entry. Also write a code to combine and display the information in text box when button is clicked.
13. Write a PHP program to check if number is prime or not.
14. Write a PHP program to print first ten Fibonacci numbers.
15. Create a MySQL data base and connect with PHP.
16. Write PHP script for string and retrieving user information from my SQL table.
   a. Write a HTML page which takes Name, Address, Email and Mobile number from user (register PHP).
   b. Store this data in MySQL data base.
   c. Next page display all user in HTML table using PHP (display .PHP).
17. Using HTML, CSS, Javascript, PHP, MySQL, design a authentication module of a web page.

CORE – 12: SOFTWARE ENGINEERING

OBJECTIVES:

- To learn the way of developing software with high quality and the relevant techniques.
- To introduce software engineering principles for industry standard.
- To focus on Project management domain and Software risks management.

Unit-1


Unit-2

Software Project Management: Software Project Management Complexities, Responsibilities of a Software Project Manager, Project Planning, Metrics for Project Size Estimation, Project

Unit-3
Software Design: Design Process, Characterize a Good Software Design, Cohesion and Coupling, Layered Arrangements of Modules, Approaches to Software Design (Function Oriented & Object-Oriented).

Unit-4

Text Book:

Reference Books:

CORE – 12 PRACTICAL: SOFTWARE ENGINEERING LAB

S. No. Practical Title
1.  • Problem Statement,
    • Process Model
2.  Requirement Analysis:
    • Creating a Data Flow
    • Data Dictionary, Use Cases
3.  Project Management:
    • Computing FP
    • Effort
    • Schedule, Risk Table, Timeline chart
4.  Design Engineering:
    • Architectural Design
    • Data Design, Component Level Design
5.  Testing:
    • Basis Path Testing

Sample Projects:
1. **Criminal Record Management**: Implement a criminal record management system for jailers, police officers and CBI officers.

2. **Route Information**: Online information about the bus routes and their frequency and fares.

3. **Car Pooling**: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.

4. Patient Appointment and Prescription Management System

5. Organized Retail Shopping Management Software

6. Online Hotel Reservation Service System

7. Examination and Result computation system

8. Automatic Internal Assessment System

9. Parking Allocation System

10. Wholesale Management System

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**CORE – 13: COMPUTER GRAPHICS**

**OBJECTIVES**

- To be able to learn the core concepts of Computer Graphics.
- To be able to create effective programs for solving graphics problems.

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**Unit-1**


**Unit-2**


**Unit-3**


**Unit-4**

Two Dimensional Viewing: Introduction to viewing and clipping, Viewing transformation in 2-D, Viewing pipeline, Clipping Window, Clipping Algorithms: Point clipping, Line clipping and Polygon clipping.
Text books

Reference books

CORE – 13 PRACTICAL: COMPUTER GRAPHICS LAB

Develop the programs using C/C++ or Java

1. Write a program to implement Bresenham’s line drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to fill a polygon using Scan line fill algorithm.
6. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).
7. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.

CORE – 14: NUMERICAL TECHNIQUES

OBJECTIVES:

- To learn various numerical techniques.
- To be able to implement different numerical techniques using programming language.

Unit-1
Floating point representation and computer arithmetic, Significant digits, Errors: Round-off error, Local truncation error, Global truncation error, Order of a method, Convergence and terminal conditions, Efficient computations.

Unit-2

Unit-3
Interpolation: Lagrange’s form and Newton’s form Finite difference operators, Gregory Newton forward and backward differences Interpolation Piecewise polynomial interpolation: Linear interpolation.

Unit-4
Numerical integration: Trapezoid rule, Simpson’s rule (only method), Newton–Cotes formulas, Gaussian quadrature, Ordinary differential equation: Euler’s method Modified Euler’s methods, Runge-Kutta second methods

Text books

Reference books
2. Introduction to Numerical Analysis, Josef Stoer and Roland Bulirsch, Springer.

CORE – 14 PRACTICAL: NUMERICAL TECHNIQUES LAB

Implement using C/ C++ or MATLAB/ Scilab
1. Find the roots of the equation by bisection method.
2. Find the roots of the equation by secant/Regula–Falsi method.
3. Find the roots of the equation by Newton's method.
4. Find the solution of a system of nonlinear equation using Newton’s method.
5. Find the solution of tri-diagonal system using Gauss Thomas method.
7. Find the cubic spline interpolating function.
8. Evaluate the approximate value of finite integrals using Gaussian/Romberg integration.

DSE-1: UNIX PROGRAMMING

OBJECTIVES:
- To learn the basics of UNIX OS, UNIX commands and File system.
- To familiarize students with the Linux environment.
- To learn fundamentals of shell scripting and shell programming.
- To be able to write simple programs using UNIX.

Unit-1
Introduction: Unix Operating systems, Difference between Unix and other operating systems, Features and Architecture, Installation, Booting and shutdown process, System processes (an overview), External and internal commands, Creation of partitions in OS, Processes and its creation phases – Fork, Exec, wait, exit.

Unit-2
User Management and the File System: Types of Users, Creating users, Granting rights, User management commands, File quota and various file systems available, File System
Management and Layout, File permissions, Login process, Managing Disk Quotas, Links (hard links, symbolic links)

Unit-3
Shell introduction and Shell Scripting: Shell and various type of shell, Various editors present in Unix, Different modes of operation in vi editor, Shell script, Writing and executing the shell script, Shell variable (user defined and system variables), System calls, Using system calls, Pipes and Filters.

Unit-4
Unix Control Structures and Utilities: Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr, uniq utilities), Pattern matching utility (grep).

Text Books:

Reference Books:

DSE–1 PRACTICAL: UNIX PROGRAMMING LAB

1. Write a shell script to check if the number entered at the command line is prime or not.
2. Write a shell script to modify “cal” command to display calendars of the specified months.
3. Write a shell script to modify “cal” command to display calendars of the specified range of months.
4. Write a shell script to accept a login name. If not a valid login name display message “Entered login name is invalid”.
5. Write a shell script to display date in the mm/dd/yy format.
6. Write a shell script to display on the screen sorted output of “who” command along with the total number of users.
7. Write a shell script to display the multiplication table of any number.
8. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
9. Write a shell script to find the sum of digits of a given number.
10. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.
11. Write a shell script to find the LCD (least common divisor) of two numbers.
12. Write a shell script to perform the tasks of basic calculator.
13. Write a shell script to find the power of a given number.
14. Write a shell script to find the greatest number among the three numbers.
15. Write a shell script to find the factorial of a given number.
16. Write a shell script to check whether the number is Armstrong or not.

**DSE–2: DATA MINING**

**OBJECTIVES:**
- To introduce the basic concepts of data warehousing, data mining, Issues, and Implication.
- To learn the core topics like Association rules, Classification & Prediction and Clustering techniques.
- To make a study on the Applications and Trends in Data Mining.

**Unit-1**

**Data Warehouse Fundamentals:** Introduction to Data Warehouse, OLTP Systems, OLAP, Differences between OLTP and OLAP, Characteristics of Data Warehouse, Functionality of Data Warehouse, Advantages and Applications of Data Warehouse, Advantages, Applications, Top-Down and Bottom-Up Development Methodology, Tools for Data warehouse development, Data Warehouse Types, Data cubes

**Unit-2**

**Introduction to Data Mining:** Data mining, Functionalities, Data Preprocessing: Preprocessing the Data, Data cleaning, Data Integration and Transformation, Data reduction, Discretization and Concept hierarchies.

**Unit-3**

**Mining Association Rules:** Basics Concepts – Single Dimensional Boolean Association Rules from Transaction Databases, Multilevel Association Rules from transaction databases, Multi dimension Association Rules from Relational Database and Data Warehouses. Apriori Algorithm, FP-Tree algorithm

**Unit-4**

**Classification and Prediction:** Introduction, Issues, Decision Tree Induction, Naïve Bayesian Classification, Classification based on Concepts from Association Rule Mining, Classifier Accuracy.

**Text Books:**

1. J. Han and M. Kamber, Data Mining Concepts and Techniques, Elsevier, 2011

**Reference Books:**


DSE-2 PRACTICAL: DATA MINING LAB

Using Scilab/ MATLAB/ C/ Python/ R

1. Build a Data Warehouse and perform its operations.
2. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets.
3. Demonstrate performing classification on data sets.
4. Demonstrate performing clustering on data sets.
5. Demonstrate performing Regression on data sets.
6. Credit Risk Assessment. Sample Programs using German Credit Data.
7. Sample Programs using Hospital Management System.

DSE-3: DATA SCIENCE

OBJECTIVES:

- To learn emerging issues related to various fields of data science.
- To understand the underlying principles of data science, exploring data analysis.
- To learn the basics of R Programming.

Unit-1
Data Scientist’s Tool Box: Turning data into actionable knowledge, introduction to the tools that will be used in building data analysis software: version control, markdown, git, GitHub, R, and RStudio.

Unit-2
R Programming Basics: Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling.

Unit-3
Getting and Cleaning Data: Obtaining data from the web, from APIs, from databases and from colleagues in various formats, basics of data cleaning and making data “tidy”.

Unit-4
Exploratory Data Analysis: Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about
the world that can be addressed by the data, common multivariate statistical techniques used to visualize high-dimensional data.

**Text Books**
1. Rachel Schutt, Cathy O'Neil, "Doing Data Science: Straight Talk from the Frontline" by Schroff/O'Reilly, 2013.

**Reference Books**
1. Foster Provost, Tom Fawcett, “Data Science for Business” What You Need to Know About Data Mining and Data-Analytic Thinking by O'Reilly, 2013.

**DSE-3PRACTICAL: DATA SCIENCE LAB**
1. Write a program that prints “Hello World” to the screen.
2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n.
3. Write a program that prints a multiplication table for numbers up to 12.
4. Write a function that returns the largest element in a list.
5. Write a function that computes the running total of a list.
6. Write a function that tests whether a string is a palindrome.
7. Implement linear search.
8. Implement binary search.
9. Implement matrices addition, subtraction and Multiplication.
10. Fifteen students were enrolled in a course. There ages were:

   20 20 20 20 20 21 21 21 22 22 22 23 23 23

   i. Find the median age of all students under 22 years
   ii. Find the median age of all students
   iii. Find the mean age of all students
   iv. Find the modal age for all students
   v. Two more students enter the class. The age of both students is 23. What is now mean, mode and median?

**DSE-4: PROJECT WORK / E-COMMERCE**

**DSE-4: E-COMMERCE**

**OBJECTIVES**

- To introduce the concepts of electronic commerce.
- To make the user understand how electronic commerce is affecting business enterprises, governments, consumers and people in general.

**Unit-1**

**Introduction to E-Commerce**: Definition and scope of E-Commerce and M-Commerce, E-Commerce trade cycle, Electronic Markets, Internet Commerce, Benefits and Impacts of E-Commerce.
**Elements of E-Commerce:** Various elements, e-visibility, e-shops, Delivery of goods and services, Online payments, After-sales services, Internet E-Commerce security.

**Unit-2**
**EDI and Electronic Payment Systems:** Introduction and definition of EDI, EDI layered Architecture, EDI technology and standards, EDI communications and transactions, Benefits and applications of EDI with example, Electronic Payment Systems: credit/debit/smart cards, e-credit accounts, e-money.

**Unit-3**

**E-Business:** Introduction to Internet bookshops, Grocery Suppliers, Software Supplies and support, Electronic newspapers, Virtual auctions, Online share dealing, e-diversity.

**Unit-4**
**E-Security and Legal Issues:** Security concerns in E-Commerce, Privacy, integrity, authenticity, non-repudiation, confidentiality, SSL, Digital Signatures and fire walls, IT Act 2000, Cyber-crimes and cyber laws


**Text Books:**

**Reference Books:**

**DSE-4 Practical: E-Commerce Tutorial**

**SEC – 1: PYTHON PROGRAMMING**

**OBJECTIVES:**
- To enable the students to understand the basic principles of the Python Language.
- To use the tools to do simple programs in python.

**Unit-1**
**Planning the Computer Program:** Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

**Unit-2**
**Techniques of Problem Solving:** Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

**Unit-3**
Overview of Programming: Structure of a Python Program, Elements of Python
Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)

Unit-4
Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments.

Text Books
1. T. Budd, Exploring Python, TMH, 1st Ed, 2011

Reference Books
1. Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist : learning with Python, Freely available online.2012

Online References:
1. Python Tutorial/Documentation www.python.or 2015

Software Lab based on Python Programming:
1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon users choice.
2. Write a Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria:
   Grade A: Percentage >=80
   Grade B: Percentage>=70 and <80
   Grade C: Percentage>=60 and <70
   Grade D: Percentage>=40 and <60
   Grade E: Percentage<40
3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. Write a Program to display the first n terms of Fibonacci series.
5. Write a Program to find factorial of the given number.
6. Write a Program to find sum of the following series for n terms: 1 – 2/2! + 3/3! - - - - - n/n!
7. Write a Program to calculate the sum and product of two compatible matrices.

SEC-2: ANDROID PROGRAMMING

OBJECTIVES:
- To learn the basics of Android Programming.
- To develop simple Android applications.

Unit-1
Unit-2
**Overview of object oriented programming using Java:** OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

Unit-3
**Development Tools:** Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating an android project – Hello Word, run on emulator, Deploy it on USB-connected Android device.
**User Interface Architecture:** Application context, intents, Activity life cycle, multiple screen sizes.

Unit-4
**User Interface Design:** Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes), Images, Menu, Dialog.
**Database:** Understanding of SQLite database, connecting with the database.

**Text Books:**

**Reference Book:**

**Online References:**

**Software Lab based on Android Programming:**
1. Create “Hello World” application. That will display “Hello World” in the middle of the screen in the emulator. Also display “Hello World” in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create a menu with 5 options and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

**AEC–1:** Environmental Science
## GE/IC–1: PRINCIPLES OF MANAGEMENT

### OBJECTIVES

- To understand the basic principles of management.
- To provide a basis of understanding towards working of business organization through the process of management.

### Unit-1

**Nature of Management:** Meaning, Definition, it's nature purpose, importance & Functions, Management as Art, Science & Profession - Management as social System Concepts of management - Administration - Organization.

**Evolution of Management Thought:** Contribution of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard & Peter Drucker to the management thought. Various approaches to management (i.e. Schools of management thought) - Indian Management Thought.

### Unit-2

**Functions of Management (Part-I)**

- **Planning** - Meaning - Need & Importance, types levels – advantages & limitations, Forecasting - Need & Techniques, Decision making - Types - Process of rational decision making & techniques of decision making,
- **Organizing** - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation – Decentralization,

### Unit-3

**Functions of Management (Part-II)**

- **Staffing** - Meaning & Importance, Direction - Nature – Principles, Communication - Types & Importance, Motivation - Importance – theories, Leadership - Meaning - styles, qualities & functions of leaders

### Unit-4

**Strategic Management**

Definition, Classes of Decisions, Levels of Decision, Strategy, Role of different Strategist, Relevance of Strategic Management and its Benefits, Strategic Management in India.

### Text Books:

1. Horold Koontz and Iteinz Weibrich, Essential of Management, McGrawhills International
2. K.Aswathapa, Essential of Business Administration, Himalaya Publishing House

### Reference Books:

1. L.M.Parasad Principles & practice of management - Sultan Chand & Sons - New Delhi
GE/IC–2: STATISTICS

OBJECTIVES

- To understand the concept of population and sample.
- To use frequency distribution to make decision.
- To understand and to calculate various types of averages and variation.

Unit-1
Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement nominal, ordinal, interval and ratio. Presentation: tabular and graphical, including histogram.

Unit-2

Unit-3
Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation (3-variables only), rank correlation. Simple linear regression.

Unit-4
Principle of least squares and fitting of polynomials and exponential curves. Theory of attributes: Independence and association of attributes, consistency of data, measures of association and contingency, Yule’s coefficient of colligation.

Text Books:

Reference Books:
1. S.P. Gupta, Statistical Methods, Sultan Chand and sons New Delhi

GE/IC–2 TUTORIAL/PRACTICAL: STATISTICS LAB

List of Practicals
1. Graphical representation of data.
2. Problems based on measures of central tendency.
3. Problems based on measures of dispersion.
4. Problems based on combined mean and variance and coefficient of variation.
5. Problems based on moments, skewness and kurtosis.
6. Fitting of polynomials, exponential curves.
7. Karl Pearson’s correlation coefficient.
8. Correlation coefficient for a bivariate frequency distribution.
9. Lines of regression, angle between two lines of regression and estimated values of variables.
10. Spearman rank correlation with and without ties.
11. Partial and multiple correlations.
12. Planes of regression and variances of residuals for given simple correlations.

GE/IC–3: BUSINESS ACCOUNTING

OBJECTIVES

- To impart the basic business accounting knowledge.

Unit-1
Conceptual Framework: Accounting Concepts, Principles and Conventions, Accounting Standards concept, objectives, benefits, brief review of Accounting Standards in India, Accounting Policies, Accounting as a measurement discipline, valuation Principles, accounting estimates

Unit-2
Depreciation: Meaning, need & importance of depreciation, methods of charging depreciation.

Unit-3
Preparation of final accounts: Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary business

Unit-4
Computerized Accounting: Computers and Financial application, Accounting Software packages, An overview of computerized accounting system - Salient features and significance, Concept of grouping of accounts, Codification of accounts, Maintaining the hierarchy of ledger, Generating Accounting Reports.

Text Books:
2. Rajesh Agarwal, R. Srinivasan, “Accounting Made Easy”, TMH

Reference Books:
OBJECTIVES:

- To introduce the economic concepts.
- To familiarize with the students the importance of economic approaches in managerial decision making.
- To understand the applications of economic theories in business decisions.

Unit-1:
Demand, Supply and Market equilibrium: individual demand, market demand, individual supply, market supply, market equilibrium; Elasticity of demand and supply: Price elasticity of demand, income elasticity of demand, cross price elasticity of demand, elasticity of supply; Theory of consumer behavior: cardinal utility theory, ordinal utility theory (indifference curves, budget line, consumer choice, price effect, substitution effect, income effect for normal, inferior and giffen goods), revealed preference theory.

Unit-2:
Producer and optimal production choice: optimizing behavior in short run (geometry of product curves, law of diminishing margin productivity, three stages of production), optimizing behavior in long run (isoquants, isocost line, optimal combination of resources) Costs and scale: traditional theory of cost (short run and long run, geometry of cost curves, envelope curves), modern theory of cost (short run and long run), economies of scale, economies of scope.

Unit-3:
Theory of firm and market organization: perfect competition (basic features, short run equilibrium of firm/industry, long run equilibrium of firm/industry, effect of changes in demand, cost and imposition of taxes); monopoly (basic features, short run equilibrium, long run equilibrium, effect of changes in demand, cost and imposition of taxes, comparison with perfect competition, welfare cost of monopoly), price discrimination, multiplant monopoly; monopolistic competition (basic features, demand and cost, short run equilibrium, long run equilibrium, excess capacity); oligopoly (Cournot’s model, kinked demand curve model, dominant price leadership model, prisoner’s dilemma)

Unit-4:
Factor market: demand for a factor by a firm under marginal productivity theory (perfect competition in the product market, monopoly in the product market), market demand for a factor, supply of labour, market supply of labour, factor market equilibrium.

Text Books:
1. Yogesh Maheswari, Managerial Economics, PHI Learning, New Delhi.

Reference Books:
1. Moyer &Harris, Managerial Economics, Cengage Learning, New Delhi.
GE/IC-4 TUTORIAL/PRACTICAL: BUSINESS ECONOMICS TUTORIAL

EQUIPMENT

1. Desktop Computer
Core i5 (minimum 8th Generation Processor, 8 GB RAM, 2 TB HDD)

Number of Desktops: 30 (or as per student strength). It must be connected through structured Local Area Network (LAN).

2. Software

FACULTY TRAINING

Most of the Colleges are offering BCA under self-financing mode. Faculty training is required for all Core Courses as well as Discipline Specific Elective Courses.
Faculty training may be organized for the following Courses in phased manner (six month before the beginning of the Subject in the concerned semester).

i. Digital Logic  
ii. Computer Organization  
iii. Data Structure  
iv. Operating System  
v. Database Systems  
vi. Java Programming  
vii. Web Technology  
viii. Unix Shell Programming  
ix. Data Mining  
x. Data Science  
xi. Programming in Python  
xii. Android Programming