RKDF UNIVERSITY RANCHI

BACHELOR OF COMPUTER APPLICATION (BCA)
New Scheme Based on NEP - 2020

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BACHELOR OF COMPUTER APPLICATION (BCA)

NEP-2020

SESSION 2023 ONWARDS

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BACHELOR OF COMPUTER APPLICATION (BCA)

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Semester–I

Subject Code	Paper Name	Credit
MJ01CPS	Programming Fundamentals using 'C'	3

Course Objectives:

Programming basics and the fundamentals of C

Mathematical and logical operations

Loops and conditional statements

Implementing pointers

File management and dynamic memory allocation

Course Content

UNITI

Program Logic development Using algorithm and Flowchart , Historical development of C, Constants, variables and keywords, C instructions. Data types - int, float, double, char, void, short, long, long double, signed, unsigned

UNIT–II

Decision control structure:-if statement, if-else statement, the conditional operators. Case control structure: switch statement, goto statement. C operators: Arithmetic, relational and logical. Development of C program using Decision control & Case control structure.

UNIT-III

Operators:-Increment and Decrement operators, Bitwise operator, Operators precedence, arithmetic and logical expressions evolution. Loop Control Structure:- for loop ,while loop and do while loop, Break statement, continue statement. Development of C programs using loops.

UNIT-IV

Arrays: One dimension array, 2D array, 3D array, Introduction to Pointers. Functions: Function Declaration and prototypes, Passing values between functions:- call by value. Development of C programs using Arrays , functions.

UNIT-V

Storage classes in C, Structures:- declaring a structure, accessing structure element, how structure elements are stored, array of structures, union.

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Semester–I

Course Content

Subject Code	Paper Name	Credit
MJL01CPS	Programming Fundamentals using 'C'-Lab	1

Course Objectives:

- Programming basics and the fundamentals of C
- Data types in C
- Mathematical and logical operations
- Using if statement and loops
- Arranging data in arrays
- Implementing pointers
- File management and dynamic memory allocation

List of Programs as Assignments:

1. Write an interactive program that will read in a +ve integer value and determine the following

2. If the integer is a prime number

3. If the integer is a Fibonacci number

4. WAP in C to compute $\sin x = x - x^3/3! + x^5/3! - x^7/7!$ ….. Continue adding successive terms in the series until the value of the next term becomes smaller (in magnitude) than 10^{-5}. Test the program for $x=1$, $x=2$, and $x=3$. In each case display the number of terms used to obtain the final answer.

5. WAP to generate every 3rd integer beginning with $I = 2$ and continue for all integers that are less than 150. Calculate the sum of those integers that are evenly divisible by.

6. WAP to find whether a given year is a leap year or not. Modify it to generate a list of leap years between two year limits given by user.

7. WAP to display the following pattern:

```
                    11

11    10                                                      11

11    10                                                      9 10
                    11

11    10                                                      9 8 9

                10 11
```

8. Using Ternary / Conditional operator find the greatest among 3 numbers.

9. WAP to convert a decimal number int to an equivalent number of the input base. Test your program for base 2 , 8, 10 & 16.

10. WAP to read a number n, and print it out digit-by-digit, as a series of words. For e.g. 123 would be print it as "one two three".

11. WAP to check whether any input +ve integer is palindrome or not.

12. WAP to simulate a simple calculator (+ - * %) that takes two operands and an operator as input and displays the result.

13. WAP to find the GCD of two input +ve integer numbers.

14. WAP to swap the values of two variables without using a third variable.

15. Read a line of mixed text, and then write it out with all lower case and upper case letters reversed, all digits replaced by 0 sand all other characters (non-letters and non- digits) replaced by '*'.

16. WAP to find the product of two matrices A and B. Display the source matrices and product matrix C in matrix format.

17. WAP to find whether a given matrix is a triangular matrix or not.

18. WAP to find the transpose of a matrix .Display the source and the transposed matrix in matrix format.

19. Implement Prob.No.–14 to 16 using functions for reading, manipulating and displaying the corresponding matrices in matrix form.

20. WAP to sort a list of strings alphabetically using a 2-dim. Character array.

21. WAP to display the row sum and the column – sum of an input 2- dim. Matrix. Display the source matrix with row and column sum.

22. Write a recursive function to calculate S = 2 + 4 + 6 + 8 + …… +2N. Implement the function in a complete C program.

23. Write a function that accepts two arguments an array and its size n. It performs Bubble up sort on the array elements. Using indirection operator '*' implement this in a complete C program. Display the source and the sorted array.

24. Using pointer, write a function that receives a character string and a character as argument. Delete all occurrences of this character in the string. The function should return corrected string with no holes.

25. Write a function for reading character string using pointer . Calculate the length of the string (without using strlen()).Finally print a string in reverse order, using pointer.

26. Implement prob .No. 14 using pointers representation of 2– dim. array.

27. Implement prob. No. 15 using pointer representation of 2 dim. array.

28. Implement prob. No. 16 using pointer representation of 2 dim. array.

29. WAP to sort a list of strings in to alphabetical order using array of pointers.

30. Create records of 60 students, where each record has fields- name, roll,

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Semester–II

Course Content

Subject Code	Paper Name	Credit
MJ02CPS	Database Management System	**3**

Course Objectives:

- Master the basics of SQL and construct queries using SQL.
- Understand the relational database design principles.
- Familiar with the basic issues of transaction processing and concurrency control.
- Familiar with database storage structures and access techniques.

UNIT – I

Introduction: Purpose of Database Systems, View of Data, Data Models, Database Languages, Relational Database, Database Architecture, Database Users and Administrators, Transaction Management.

UNIT – II

Relational Data Models and Languages: Basic Concepts, Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R Features, Reduction of an E-R Diagram to Tables, The Relational Algebra, The Tuple Relational Calculus and The Domain Relational Calculus.

UNIT – III

Relational-Database Design: Pitfalls in Relational-Database Design, Functional Dependencies, Decomposition, Desirable Properties of Decomposition, First Normal Form, Second Normal Form, Third normal Form, Boyce- Codd Normal Form, Fourth Normal Form and More Normal Forms.

UNIT – IV

Query Processing and Optimization: Overview, Measures of Query Cost, Selection Operation, Join Operation, Other Operations, Evaluation of Expressions, Transformation of Relational Expressions, Estimating Statistics of Expression Results, and Choice of Evaluation Plans.

UNIT – V

Transactions and Concurrency Control: Transaction Concept, Transaction State, Desirable Properties of Transactions, Concurrent Executions, Serializability, Recoverability, Lock-Based Protocols, Timestamp-Based Protocols and Deadlock Handling.

Text Books:

1. Silberschatz, Korth, &Sudarshan, "Database System Concepts", 6th Edition, McGraw Hill , 2011.

Reference Books:

1. Elmasri, & Navathe, "Fundamentals of Database Systems",5th Edition, Pearson Education,2008.

Learning Outcomes

- Produces an Entity-Relationship model from a realistic problem specification.

- Describes the conceptual schema of a database.

- Describes the physical schema of a database.

- Uses formal design techniques to produce a database schema.

- Applies normalization techniques.

- Prepares logical construction.

- Designs and applies database from the logical schema model.

- Manages a designed database.

- Arranges database using Relational algebra.

- Organizes database using SQL.

- Discusses the relative merits of the relational environment.

- Applies the changes in environment to database.

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Semester–II

Course Content

Subject Code	Paper Name	Credit
MJL02CPS	Database Management System Lab	**1**

Course objectives

- Students get practical knowledge on designing and creating relational database systems.
- Understand various advanced queries execution such as relational constraints
- joins, set operations, aggregate functions, trigger, views and embedded SQL.
- Consider the following tables: emp(empno, ename, job, mgr, hiredate, sal, comm,d eptno, gr), dept(deptno, dname, loc)

Write the following queries:

1. List all information about all departments from emp table.
2. List all employee names along with their salaries from emp table.
3. List all department numbers, employee numbers and their managers numbers in descending order of dept no from emp table.
4. List department names and locations from the dept table.
5. List the employees belonging to the department20.
6. List the name and salary of the employees whose salary is more than 1000.
7. List the names of the clerks working in the department 20.
8. List the names of analysts and salesmen.
9. List the details of the employees who have joined before the end of September 81.
10. List the names of employees who are not managers.
11. List the names of employees whose employee number are 7369, 7521, 7839, 7934, 7788.
12. List the employee details not belonging to the department10, 30, and 40.
13. List the employee name and salary, whose salary is between 1000 and 2000.
14. List the employee names, who are not eligible for commission.(salary having >15,000 eligible for commission)
15. List the employees who are eligible for commission.
16. List the details of employees, whose salary is greater than 2000 and commission is NULL.
17. List the employees whose names start with an "S"(not "s").
18. List the name, salary and PF amount of all the employees (PF is calculated as 10% of salary).

19. List the empno, ename, sal in ascending order of salary.

20. List the employee name, salary, job and Department no descending order of Department No and salary.

21. List the employee details in ascending order of salary.

22. List the employee details in descending order of salary

23. Display name, and sal and commission of all employees whose monthly salary is greater than their commission.

24. Select "Smith Has Worked In The Position Of Clerk In Dept 20", Display result in this format.

25. Generate a statement which prompts the user at runtime. The intention is to display employees hired between 2 given dates.

26. Define a variable representing an expression used to calculate total annual remuneration .Use the variable in a statement which finds all employees who earn $30000 a year or more.

27. List all the employees name and salaries increased by 15% and expressed as a whole number of dollars.

28. Produce the following

EMPLOYEE   AND   JOB

SMITH   CLERK

ALLEN   SALESMAN

29.   Produce the following output:

SMITH   (Clerk)

ALLEN   (Salesman)

30.   Do a case sensitive search for a list of employees with a job that the user enters.

31.   It has been discovered that the sales people in dept.30 are no tall male. Please produce the Following output.

ENAME   DEPTNO   JOB

ALLEN   30   Sales Person

32.   Display each employees name and hire date of dept 20.

33.   Display each employee's name, hired at date and salary review date. Assume salary review date is one year from hire date. Output should be in ascending review date.

34.   Print list of employees displaying just salary, if more than 1500. If exactly 1500 display "On Target". If less than 1500 display "Below 1500".

35.   Write a query which returns DAY of the week (i.e. MONDAY)for any date entered in the format DD/MM/YY.

36. Write a query to calculate length of service of each employee.

37. Find the minimum salary of all employees.

38. Find the maximum, minimum, and average salaries of all employees.

39. List the maximum and minimum salary of each job type.

40. Find how many managers are in each dept.

41. Find the average salary and average total remuneration of each job type. Remembers salesman earn commission.

42. Find out the difference between highest and lowest salary.

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Semester–II

Course Content

Subject Code	Paper Name	Credit
MJ03CPS	Object Oriented Programming with C++	**3**

Course Objectives:

The basic programming and OOPs concepts

- Creating C++ programs
- Tokens, expressions and control structures in C++
- Arranging same data systematically with arrays
- Classes and objects in C++
- Constructors and destructors in C++
- Files management and templates in C++
- Handling exceptions to control errors

UNIT –I

Principles of OOP, procedure oriented programming vs. object oriented programming, basic concepts, advantages, application of OOPs, object oriented languages. Beginning with C++: What is C++ , structure of C++ program, creating, compiling, linking & executing a C++program, Tokens, expressions & control structures, keywords, identifiers, basic data types, user- defined data types, derived data types, symbolic constants, type compatibility, variable declaration, dynamic initialization of variables, reference variables.

UNIT –II

Operators in C++: scope resolution operator, memory management operators, manipulators, type cast operators, operators, operator precedence, control structures. Functions in C++: Main functions, function prototyping, call by reference vs. call by value, inline functions, default arguments, const arguments, function overloading, friend functions. Classes and objects: specifying a class, defining member functions, making an outside functions inline, private member function; array within a class, memory allocation for object; static data members, static member functions, array of objects, objects as function arguments, returning objects.

UNIT-III

Constructors and Destructors: Constructors, Parametric Constructors, Multiple Constructors in a class, constructors with default arguments. Dynamic initialization of objects, copy constructors,

dynamic constructors, destructors. Operator Overloading & Type Conversions: Definition of Overloading, &Operator Overloading, rules for Overloading Operators, Overloading Unary Operators, Binary Operators, Binary Operators using Friends.

UNIT –IV

Inheritance: defining derived classes, single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, virtual base class, abstract classes, constructors in derived classes, member class, nesting ofc lass.

UNIT –V

Pointers, virtual functions and polymorphism, pointers to objects, this pointer, pointers to derived class, pure virtual functions, exception handling in C++, managing console I/O operations, working with files :open, close, basic read-write operations on files .

Suggested Readings:

- Object Oriented Programming with C++ by E Balagurusamy.

- Programming in C++ by Robert Lafore

- C++-The complete Reference –by Herbert Schildt(TMH)

- Programming with C++, Schaum Series4.OOP'sconcepts –by David Parsson.

Course Outcome

After completing this course, you will be able to:

- Describe OOPs concepts

- Use functions and pointers in your C++ program

- Understand tokens, expressions, and control structures

- Explain arrays and strings and create programs using them

- Describe and use constructors and destructors

- Understand and employ file management

- Demonstrate how to control errors with exception handling

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Semester–II

Subject Code	Paper Name	Credit
MJL03CPS	Object Oriented Programming with C++ Lab	**1**

Course objectives:

- C++ is a programming language with a special focus on the concepts of OOPs and their implementation.
- It has object- oriented features, which allow the programmer to create objects within the code.
- This makes programming easier, more efficient, and some would even say, more fun.

Course Content

List of Practical's for Assignment:-

1. WAP to show the characteristic of a number. {E.g. 24 it has two coefficients 2 in tens position and 4 in units position. It is composed of 2 and 4. It is a positive number} Also show whether it is odd or even.
2. WAP to take input through command line argument and do the following:
3. Check whether the number is prime.
4. Generate the reverse a number.
5. Write a menu driven program using switch in C++to perform following:
- For input of 1, check whether the number is prime
- For input of 3, find the factors of the number
- For input of 5, check the number is odd or even.
6. Write a program in C++ to generate hexadecimal equivalent of a number without using array.
7. WAP to take two number inputs through command line argument and do the following:
8. Check whether two numbers are prime to each other or not.
9. Find LCM of two numbers.
10. WAP to create class and exhibit the role of static functions (other than main) by declaring, defining and calling them.
11. WAP to compute and display the count of occurrence of 4 in a number. E.g. 4564 will compute 2.
12. WAP to take an angle value in degrees and then compute the equivalent radians and then prove $\sin^2 \square \square \cos^2 \square \square 1. \text{Note} 180^o \square \square^c.$

13. WAP to sort a list of numbers in ascending order.

14. WAP to generate Pascal's Triangle using a square matrix.

15. Write a program in C++ to take input of two 3×3 matrices through command line argument and then:

Add them up and display the result

Multiply them and display product

16. WAP to count the number of words, characters in a sentence.

17. Write a program in C++ to take input of a sentence through command line argument and then count the number of words and vowels.

18. WAP to handle the Exception using try and multiple catch block; the exceptions that you will handle are, number format error , array bound error and divide by zero.

19. WAP to create a class called Room with two data member length and width and then implement construct or over-loading in it.

20. Write a program in C++to explain the role of the following:

- Non-parameterized constructor

- Parameterized constructor

- Copy constructor Take input and display the output.

21. WAP to create a class called **Fraction** with data member numerator and denominator; take input (through command line argument) of two fractions and then add, subtract, multiply and divide, finally display the result in reduced term.

22. Write a program in C++ to create a class for **Employee** having 2 data member code and name. Then create 3 classes **Officer**, **Admin Staff** and **MStaff**. The **Officer** class has data members designation and pay-scale; the **Admin Staff** has data members grade and pay-band; the **MStaff** has data member department and two sub-classes **Regular** and **Casual**. The **Regular** staff has data member's level and consolidated-pay and **Casual** has data member daily-wage. Take allinputsthroughconstructorsandwriteappropriatemethodsfordisplayingonedataforeachtypeofclass.

23. WAP to design a class called **Account** using the inheritance and static that show all function of bank(withdrawal, deposit) and generate account number dynamically.

24. WAP to design an application *Password in C++* that produces and prints a random password depending upon name of an individual. If the input is Abdul Kalam then the password would be*33421LAM*. Note: take the first name A=1, B=2, D=4, U=21 where 2+1=3, and L=12, where1+2=3;so the number comes to be*12433*, so u can find out.

25. WAP to draw a format like

*

***

*****

****

*****

***

*

Subject Code	Paper Name	Credit
MJL04CPS	Data Structure Lab Using C++	**4**

Course Objective:

1. To provide the knowledge of basic data structures and their implementations.

2. To understand importance of data structures in context of writing efficient programs.

3. To develop skills to apply appropriate data structures in problem solving.

Course Content

List of C++ Programs

1. Program to Find the Number of Elements in an Array

2. Develop and Implement a menu driven program in C++ for the following Array operations

    A. Creating Array of N Integer elements.

    B. Display of Array elements with suitable headings.

    C. Inserting an element (ELEM) at a given valid position(POS).

    D. Deleting an element at a given valid position (POS).

    E. Exit

3. Programs for Stack, Queues and Circular Queues using Arrays

4. Program to convert an Infix Expression into Postfix and Postfix Evaluation

5. Program to implement stack using arrays

6. Program to implement stack using linked list

7. Program to implement multiple stack in a single array

8. Program to convert in fix notation to postfix notation using stacks

9. Program to implement queue using arrays

10. Program to implement queue using pointers

11. Program to reverse elements in a queue

12. Program to implement circular queue using arrays

13. Program to create add remove & display element from single linked list

14. Program to create add remove & display element from double linked list

15. Program to count number of nodes in linear linked list

16. Program to create add remove & display element from circular linked list

17. Programs to implement stack & queues using linked reppresentation

18. Program to concatenate two linear linked lists

19. Program to accept a singly linked list of integers & sort the list in ascending order.

20. Program to reverse linked list

21. Program to represent polynomial using linked list

22. Program to add two polynomials using linked list

23. Program for the creation of binary tree, provide insertion & deletion in c++

24. Program for pre-order, post-order & in-order traversals of a binary tree using non recursive.

25. Program to count no of leaves of binary tree

26. Program for implementation of B-tree(insertion & deletion)

27. Program for implementation of multi-way tree in c++

28. Program for implementation of AVL tree

29. Program to implement bubble sort program using arrays

30. Program to implement merge sort using arrays

31. Program to implement selection sort program using arrays

32. Program to implement insertion sort program using arrays

33. Program to implement topological sort using arrays

34. Program to implement heap sort using arrays

35. Program to implement heap sort using pointers

36. Program to implement bubble sort program using pointers

37. Program to implement linear search using pointers

38. Program to implement binary search using pointers

39. Program to implement linear search using arrays

40. Program to implement binary search using arrays

Text Books:

1. Baluja GS, "Data Structure through C", Ganpat Rai Publication, New Delhi, 2015.

2. Pai GAV, "Data Structures and Algorithms: Concepts, Techniques and Applications", 2ndEdn, Tata McGraw- Hill, 2008.

3. Horowitz E., Sahni S., Susan A., "Fundamentals of Data Structures in C", 2nd Edition, University Press,2010.

Reference Books:

1. Tremblay J.P.**,** Sorenson P.G, "An Introduction to Data Structures with Applications", 2nd Edn, McGraw- Hill, Inc .New York, NY, USA.

2. Lipschutz Seymour, "Data Structures", 6th Edn, 9th Reprint2008, Tata Mc Graw-Hill.

3. Drozdek Adam, "Data Structures and Algorithms in C++", Thomson Learning, New Delhi– 2007.

4. Feller J., Fitzgerald B., "Understanding Open Source Software Development", Pearson Education Ltd. New Delhi.

<u>Learning Outcome:</u>

a) Understand the concept of Dynamic memory management, data types, algorithms, Big O notation.

b) Understand basic data structures such as arrays, linked lists, stacks and queues.

c) Describe the hash function and concepts of collision and its resolution methods

d) Solve problem involving graphs, trees and heaps

e) Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.

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Semester–III

Subject Code	Paper Name	Credit
MJ05CPS	Operating System	**3**

Course objectives:

- Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.

- Able to implement C programs using Unix system calls.

Course Content

UNIT –I

Operating System Definitions, its Components, Evolution of Operating System, types of operating systems: batch, multi-programmed, multitasking, desktop, multiprocessor, real-time, client-server, peer-to-peer, distributed, clustered and handheld. Operating system services, dual-mode operation, protection of I/O, memory and CPU. Non-virtual and virtual machines.

UNIT –II

Scheduling: Basic Concepts, preemptive and non-preemptive scheduling. Scheduling Algorithms. Types of scheduling:-batch, interactive and real-time. Goals of scheduling algorithms. FCFS, SJF, RR, priority, multiple queues, and three-level scheduling.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. Banker's algorithm.

UNIT-III

Memory Management Concepts: Address Binding, logical and physical address space, dynamic loading etc., Contiguous allocation methods –static & dynamic partitioned memory allocation. Concepts of fragmentation, swapping, relocation, compaction, protection, sharing. Segmentation. Non–contiguous allocation methods–Paging: basic principle of operation, h/w support for paging, protection and sharing. Virtual memory: concept of demand paging, Page fault, page replacement algorithms –FIFO,LRU, OPT. Thrashing, Concept of Page fault frequency, pre-paging, decision about minimum number of frames, page size.

UNIT –IV

File system implementation, Responsibilities of file management system, directory implementation as linear list/ hash table, directory structure, disk organization, disk controller and driver, disk space management –contiguous allocation, noncontiguous allocation –chaining and indexing, disk address translation. Idea about disk caching, disk mirroring. Disk scheduling algorithms. Disk management.

UNIT –V

Device Management: I/O hardware, Techniques for device management. Dedicated devices, shared devices, virtual peripherals. Security & protection: Security threats and goals, penetration attempts, Security policies and mechanism, authentication, protection and access control. Inter-process communication, need for inter-process synchronization. Deadlocks –definition, avoidance, detection, prevention and recovery.

Suggested Readings:

1. Operating System Concepts –by Silberschatz, Galvin and Gagne.
2. Operating System Concepts and Design –by Milenkovic
3. Operating System–by Tanenbaum.
4. Operating System–by Peterson.

Learning Outcomes:

Comprehend how an operating system virtualizes CPU and memory. Discuss various scheduling and swapping policies. Learn basic concurrent programming in C and assembly code. Explain how a simple file system organizes data in hard Disc.

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Semester–III

Subject Code	Paper Name	Credit
MJL05CPS	Operating System Lab	**1**

Course objectives:

Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.

Able to implement C programs using Unix system calls.

Course Content

List of Experiments:

1. Write a program in c++ to implement FCFS CPU Scheduling.

2. Write a program in C++ to implement SJF CPU Scheduling.

3. Write a program in C++ to Round Robin Scheduling.

4. Write a program in c++ to Present the life cycle of a process.

5. Write a program in c++ to implement the concept of Deadlock.

Learning Outcomes:

Comprehend how an operating system virtualizes CPU and memory. Discuss various scheduling and swapping policies. Learn basic concurrent programming in C and assembly code. Explain how a simple file system organizes data in hard Disc.

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Semester–IV

Subject Code	Paper Name	Credit
MJ06CPS	Computer Architecture	**4**

COURSE OBJECTIVES:

1. Discuss the basic concepts and structure of computers.

2. Understand concepts of register transfer logic and arithmetic operations.

3. Explain different types of addressing modes and memory organization.

4. Learn the different types of serial communication techniques.

5. Summarize the Instruction execution stages.

Course Content

UNIT –I

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instruction, Timing and Control, Infarction Cycle, Memory Reference Instruction, Input-Output Interrupt, Design of Basic Computer, Design of Accumulator Logic.

UNIT –II

Basic Computer Organizations and Design: Instruction Cycle, Memory –Reference Instructions, Registerreferenceinstructions,Input-

OutputInstructions,DesignofAccumulatorLogicShiftUnit.CentralProcessing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes.

UNIT-III

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

UNIT-IV

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Direct Memory Access, Input-Output Processor.

UNIT –V

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Suggested Readings:

1. Morris Mano, Computer System Architecture, 3rd Edition, Prentice -Hall of India Private Limited, 1999.

2. William Stallings, Computer Organization and Architecture, 4th Edition, Prentice Hall of India Private Limited, 2001

2. Harry & Jordan, Computer Systems Design & Architecture, Addison Wesley, Delhi, 2000.

3. Malvino, "Digital Computer Electronics: An Introduction to Microcomputers", McGraw Hill, 1993.

COURSE OUTCOMES:

1. Understand the theory and architecture of central processing unit.

2. Analyze some of the design issues in terms of speed, technology, cost, performance.

4. Design a simple CPU with applying the theory concepts.

5. Use appropriate tools to design verify and test the CPU architecture.

6. Learn the concepts of parallel processing, pipelining and inter-processor communication.

7. Understand the architecture and functionality of central processing unit.

8. Exemplify in a better way the I/O and memory organization.

9. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation

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Semester–IV

Course Content

Subject Code	Paper Name	Credit
MJ07CPS	Fundamental of Computer Algorithms	**4**

Course objective of Design and Analysis of Algorithms

Analyze the asymptotic performance of algorithms. Write rigorous correctness proofs for algorithms. Demonstrate a familiarity with major algorithms and data structures.

UNIT–I

Introduction:

What is an algorithm? Design and performance analysis of algorithms, space and time trade-offs. Analysis of selection sort and insertion sort. Asymptotic notations (O,è,¿,ωo) to measure complexity of algorithms.

UNIT –II

Recursion:

Basic concept. Analysis of recursive algorithms, Master's theorem. Divide & Conquer: The general method. Binary search, finding the maximum and minimum, merge sort, quick sort, Best and worst case analysis for the mentioned algorithms.

UNIT–III

The Greedy Method:

The general method. Applications to Knapsack problem, minimum weight spanning trees: Prim's & Kruskal's algorithms. Dijkstra's algorithm for finding single source shortest paths problem.

UNIT–IV

Algorithms on Graphs:

Breadth First Search, Depth First Search, Bi-connectivity, Depth First Search of a Directed Graph, Topological Sorting.

UNIT –V

Basic concepts of Backtracking:

8-queen problem, Branch and Bound: 0/1 Knapsack problem, assignment problem**.**

Text Books:

- Cormen Thomas H., Leiserson Charles E., & Rivest. Ronald L.," Introduction to Algorithms PHI publication.

- Horowitz Ellis, Sahni Sartaj and Rajasekaran S., "Fundamentals of Computer Algorithms" Galgotia publications.

Reference Books:

1. A ho Alfred V., Hop croft John E. & Ullman Jeffrey D., "The D e sign & Analysis of Computer Algorithms", Addison Wesley Publications.
2. Kleinberg Jon& Tardos Eva, "Algorithm Design", Pearson Education Publications.
3. Brassard Gilles & Bratley Paul, "Fundamentals of Algorithms", PHI Publications.

Course outcome:

Upon completion of this course, students will be able to do the following: Analyze the asymptotic performance of algorithms. Write rigorous correctness proofs for algorithms. Demonstrate a familiarity with major algorithms and data structures.

RKDF UNIVERSITY RANCHI

BACHELOR OF COMPUTER APPLICATION (BCA)
New Scheme Based on NEP - 2020
Semester–IV

Subject Code	Paper Name	Credit
MJ08CPS	Object Oriented Programming in Java	**3**

Course objective:

1. To understand the basic concepts and fundamentals of platform independent object oriented language.
2. To demonstrate skills in writing programs using exception handling techniques and multithreading.
3. To understand streams and efficient user interface design techniques.

Course Content

UNIT-I

Procedure- Oriented Programming, Object-Oriented programming, Benefits of OOP, Applications of OOP, Basics, Evolution of Java, Structure of JAVA Program, Simple Java Program, Tokens, Comments, Identifiers, Operators ,Literals, Control Structures. Java Environment Setup, Compiling a Java Program, Java Virtual Machine, Philosophy of Java and Benefits.

UNIT -II

Data types and program statements: Primitive and reference data types, variables and constants, enumerated constants, labeled statement, expression and null statements, compound statement, control statement – decision and loops, jump statement, declaration statement, try-throw-catch-finally statement, declaring and creating arrays, accessing array elements, assigning values to array elements, multi-dimensional arrays.

UNIT-III

Functions, Data Abstraction and classes: Declaration, definition and call, main method arguments, reference variables, method overloading, parameter passing by value for primitive types, object references and arrays, scope of variables, return from methods.

Class and object, class members and initialization, access rights of members – public, private and protected access modifiers, constructor and copy constructor, mutability, finalization, dynamic memory management, garbage collection, this keyword, static members, scope of variables, interface–declaration, implementation and extending, package and package visibility.

UNIT–IV

Inheritance and Collection classes: multi-level and single inheritance ,multiple inheritance of interfaces, Object class, access rights in subclasses and packages, constructor calling sequence, super keyword, dynamic binding of methods, abstract class, overriding, shadowing and hiding, finalize, association, aggregation and composition. String, String Buffer, Date, Calendar, Math, Object, Class, Exception class

UNIT –V

Input/ Output and JAVA Applets: Stream classes – Input Stream, Output Stream, Buffered Stream, file classes and handling, pushback streams, reader and writer classes, file reader and writer, serialization. Applet code example, HTML tags for applet, applet life cycle, color, font and basic GUI handling, basic graphics, and animation.

Text Books:

1. BalagurusamyE.,"ProgramminginJava",2ndEdition,TataMcGrawHillPublication,NewDelhi.

Reference Books:

1. Naghton Patrick & SchildtH.,"The Complete Reference Java2",Tata Mc Graw Hill Publication, New Delhi.

2. Dietel Harvey M & Dietel PaulJ.,"Java How to program",7 thedition, Pearson Education, New Delhi.

Course Outcomes:

After successful completion of the course, the students are able to

1. Use the syntax and semantics of java programming language and basic concepts of OOP.

2. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.

3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

4. Design event driven GUI and web related applications which mimic the real word scenarios.

Subject Code	Paper Name	Credit
MJL08CPS	Object Oriented Programming Lab in Java	**1**

3. WAJP to show the characteristic of a number. {E.g. 24 it has two coefficients 2 in tens position and 4 in units position. It is composed of 2 and 3. It is a positive number. Also show whether it is odd or even.

4. WAJP to take input through command line argument and do the following:

5. Check whether the number is prime.

6. Generate the reverse a number.

7. Write a menu driven program using switch in Java to perform following:

8. For input of 1, check whether the number is prime

9. For input of 3, find the factors of the number

10. For input of 5, check the number is odd or even.

11. Write a program in Java to generate hexadecimal equivalent of a number without using array.

12. WAJP to take two number inputs through command line argument and do the following:

13. Check whether two numbers are prime to each other or not.

14. Find LCM of two numbers.

15. WAJP to create a class and exhibit the role of static functions (other than main) by declaring, defining and calling them.

16. WAJP to compute and display the count of occurrence of 4 in a number. E.g. 4564 will compute2.

17. WAJPtotakeananglevalueindegreesandthencomputetheequivalentradiansandthenprove

$\sin^2 \cos^2$ 1.

  Note180^o c .

18. WAJP to sort a list of numbers in ascending order.

19. WAJP to generate Pascal's Triangle using a square matrix.

20. Write a program in Java to take input of two 3×3 matrices through command line argument and then:

A. Add them up and display the result

B. Subtract them and display the result

C. Multiply them and display product

21. WAJP to count the number of words, characters in a sentence.

22. Write a program in Java to take input of a sentence through command line argument and then count the number of words and vowels.

23. WAJP to handle the Exception using try and multiple catch block; the exceptions that you will handle are, number format error, array bound error and divide by zero.

24. WAJP to create a class called **Room** with two data member length and width and then implement constructor overloading init.

25. Write a program in Java to explain the role of the following:

- Non-parameterized constructor

- Parameterized constructor

- Copy constructor

Take input and display the output.

26. WAJP to create a class called **Fraction** with data member numerator and denominator; take input(through command line argument) of two fractions and then add, subtract, multiply and divide, finally display the result in reduced term.

27. Write a program in Java to create a class for **Employee** having 2 data member code and name. Then create 3 classes **Officer**, **Admin Staff** and **M Staff**. The **Officer** class has data members' designation and pay-scale; the **Admin Staff** has data members grade and pay-band; the **MStaff** has data member department and two sub-classes **Regular** and **Casual**. The **Regular** staff has data members level and consolidated-pay and **Casual** has data member daily-wage. Take all inputs through constructors and write appropriate methods for displaying one data for each type of class.

28. WAJP to design a class called **Account** using the inheritance and static that show all function of bank (withdrawal, deposit) and generate account number dynamically.

29. WAJP to design an application *Password. Java* that produces and prints a random password depending upon name of an individual. If the input is Abdul Kalam then the password would be*33421LAM*. Note: take the first name A=1, B=2, D=4, U=21 where 2+1=3, and L=12, where 1+2=3;so the number comes to be, so u can find out.

30. WAJP to draw a format like

*

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*****

****

*****

***

*

31. WAJP to take a string count all vowels and then delete the same from the string.

32. Write a **Patient** class which inherits from the **Person** class. Patient can again be of two types, indoor and outdoor. The Patient class requires the following:

- A vailable to store the patient ID for the patient

- a variable to store the department of hospital

- a variable to store the ward of hospital

- a variable to store the patient 's date of joining the hospital

- a variable to store the patient 's address

- a variable to store the medical fees that the patient pays

- constructor methods, which initialize the variables

- a method to calculate the medical fees (for both indoor and outdoor patient)

33. WAJP to take a string as password and check whether it contains at least two numbers, 3 alphabets and no space in it. If any contrary throw message.

34. Write a program in Java to create a class called Rational having two data members for numerator and denominator. Take two inputs of rational numbers and perform multiplication and division. Display the result in reduced form.

35. Write a program in Java to print a format like

* * * * * * *

* * * *

* *

36. Write a class called **Shape** which contains a user-defined interface for **Computation**, which contains methods for calculation of area, perimeter and volume. Write four classes for **circle, rectangle, sphere** and **rectangular parallelepiped**, and all these classes inherit from Shape. Now take input for the following:

- radius of circle and compute its area and perimeter

- Length and breadth of rectangle and compute its area and perimeter

- Length, breadth and height for **rectangular parallelepiped** and compute its area and volume

- Radius of sphere and compute its area andvolume

- **Areaofcircle=r^2, perimeter of circle = $2r$, area of sphere=$4r^2$, volume of sphere=$4r^3$,

- volume 3 of rectangular parallelepiped = $l\ b\ h$ area of rectangular parallelepiped= $2(l\ b\quad b\quad h\ h$

Subject Code	Paper Name	Credit
MJ09CPS	MICROPROCESSORS	**3**

Microprocessors and microcontrollers Course Outcomes:

At the end of this course, students will demonstrate the ability to

1.   Do assembly language programming.

2.   Do interfacing design of peripherals like I/O, A/D, D/A, timer etc.

3.   Develop systems using different microcontrollers.

Module 1: Fundamentals of Microprocessors: (7Hours)

Fundamentals of Microprocessor Architecture. 8-bitMicroprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers. Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems. Overview of the 8051 family.

Module 2 :The 8051 Architecture (8 Hours)

Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Module 3: Instruction Set and Programming (8 Hours)

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers. Programming and debugging tools.

Module4: Memory and I/O Interfacing (6 Hours):

Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, memory devices.

Module 5: External Communication Interface (6 Hours)

Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.

Module6: Applications (06 Hours)

LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing.

Text / References:

1. M.A. Mazidi, J. G. Mazidi and R. D. McKinlay, "The 8051 Micro controller and Embedded Systems: Using Assembly and C", Pearson Education, 2007.
2. K.J.Ayala,"8051Microcontroller",DelmarCengageLearning,2004.
3. R. Kamal, "Embedded System", McGraw Hill Education, 2009.
4. R. S. Gaonkar, ", Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing,1996

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BACHELOR OF COMPUTER APPLICATION (BCA)
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SEMESTER–V

Course Content

Subject Code	Paper Name	Credit
MJL09CPS	Microprocessors Lab	**1**

- **Demonstration of pins of a Microprocessor.**

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BACHELOR OF COMPUTER APPLICATION (BCA)
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SEMESTER–V

Course Content

Subject Code	Paper Name	Credit
MJ10CPS	Web Programming	**3**

Course Objectives

Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice. Develop skills in analyzing the usability of a web site. Understand how to plan and conduct user research related to web usability. Learn the language of the web: HTML and CSS.

UNIT–I

Introduction to Internet and HTML: Introduction to Internet, Internet Services, Web Server, Web Client, Domain Registration, Internet Security. HTML Tags, HTML Documents, Header Section, Body Section, Headings, Link Documents using Anchor Tag, Formatting Characters, Font tag, Images and Pictures, Listing, Tables in HTML.

UNIT –II

Java Script: Data Types, Variables, Operators, Conditional Statements, Array Objects, Date Objects, String Objects**,** Use of Java Script in Web Pages, Advantages of Java Script, Type Casting, Array, Operators and Expression, Conditional Checking, Function, User Defined Function.

UNIT–III

Understanding XML: Overview of XML, XML Families of Technology, Creating XML Documents, Rules for Well-Formed XML, Discerning Structure, Working with Mixed content, Adding Comments, CDATA Sections, Creating a DTD-The Concept of a Valid XML Document, Creating a DTD for an existing XML File.

UNIT–IV

ASP. NET: Building Web Forms Using ASP.NET, Exploring ASP.NET Server Controls, Using ASP.NET Server Controls to Create Web Forms, Understanding the Code behind the Page. Working with User Controls, Exposing User Control Properties and Methods, Using ASP.NET Server Controls in User Controls, Using Validation Controls to Improve Web Forms, Uploading Files to a Web Server.

UNIT –V

PHP: Preparing the Use PHP, Exploring PHP for the First Time, Understanding PHP Basics,

Displaying PHP Output, Managing PHP Program Flow. Planning a PHP Web Application, Creating and Using a Logon Window, Managing System Data, Updating a PHP Web Application.

Text Books

1. Xavier C.,"Web Technology & Design", New Age International Publishers, 1stEdn, New Delhi,2004.

2. Bai Xue, Ekedahl Michael, Farrell Joyce, Gosselin Don, Zak Diane, Kaparthi Shashi, Macintyre Peter, Morrissey Bill, "The Web Warrior Guide to Web Programming", India Edition, Thomson Education.

Reference book

1. RossIvan Bay, "Web Enable Commercial Application Using HTML, DHTML", BPB Publication.

Learning Outcomes: Learn to be a Full-Stack Developer

Structure and implement HTML/CSS.

Apply intermediate and advanced web development practices.

Implement basic JavaScript.

Create visualizations in accordance with UI/UX theories.

Develop a fully functioning website and deploy on a web server.

Subject Code	Paper Name	Credit
MJL10CPS	Web Programming Lab	**1**

Course Objectives

Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice. Develop skills in analyzing the usability of a web site. Understand how to plan and conduct user research related to web usability. Learn the language of the web: HTML and CSS.

Unit-I

SYLLABUS

1. India is a large country. Different regions observe variations in climate. The spoken language of one state is quite different from that of another. They wear different types of garments. They celebrate different festivals and perform varied religious rites. People belonging to diverse cultures belong to different religious faiths. In spite of these diversities, Indians feel a sense of unity and oneness among them. Thus, we conclude that India is a land of Unity in Diversity.

2. All the headings should be H2 and green colour.

3. Main heading should be H1 and centre aligned.

4. The back ground should be yellow colour.

5. There are 10 paragraphs so each of them should be made using P tag.

6. The Introduction and Conclusion paragraphs should have "Times New Roman" font, the size should be 12 and colour should be blue.

7. All the remaining paragraphs text should be pink and magenta colouredinan alternate way.

8. Thereshouldbeonemeaningfulpictureinthewebpagewithspecificdimension.

9. Create a web page having a list as shown below:

• Food

1. Fruit

2. Apple

3. Mango

4. Pear

5. Vegetable

6. Potato

7. Tomato

8. Carrot

- Dress

1. Ethnic wear

2. Kurta

3. Sherwani

4. Western wear

5. suit

6. jeans

- Sports

1. Indoor sports

2. carom

3. table tennis

4. Outdoor sports

5. Cricket

6. Hockey

7. Create a web page with the following:

A. A super script and subscript tag

B. Pre tag

C. Paragraph tag

D. Anchor tag

E. Image tag

F. Definition list tag

G. Marquee tag

H. Horizontal line tag

I. Break tag

J. Heading tag

8. Create a web page having 10 divisions each having separate background color and text color using <DIV> tag. At the top right corner there should be an image hyperlink opening in a new web page.

1. Create a web page with a form loaded into it and take input of three strings through three text boxes and then concatenate them without using any built-in function.

2. Create a web page with two tables. First one should have 1 row and 5 columns and the second one with 3 rows and 4 columns. The contents of the first table should be center aligned and contents of the second table should be right aligned. Each column of the first table should have separate Colors and each row of these cond table should have separate colors.

3. Write a Java Script program to calculate and display the aggregate and percentage of three subjects' (Physics, Chemistry and Mathematics) marks along with the name of a student. The name and individual marks input shall be taken by text box in the web page.

4. Writea Java Script program to search the element 4 in the array[2,6,4,10,4,0, -2] using any method.

5. Create a framed webpage with different frames as below:

Contents of 1st, 3rd, 5th, 7th frame should be same again2^{nd}, 4th, 6th and 8th should be same.

6.   Create a web page to take input of a string and check whether it is a palindrome or not.

7.   Write a program using Java Script to display a structure as given below:

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8.   Write a program using Java Script to take input of an array of numbers like [-4, 5, 6,-1, 10] and then sort it in descending order.

9.   Create a web page to take input of a string and reverse that without using any user defined function.

10.   Write a Java Script program to search 10 in the array [2, 6,-5, 10, 11, 0,-2] using a binary search method.

11. Write a Java Script program to take two arrays like[3,7,1,6,2,3] and [5,6,0,-3] and merge the min to third array along with that remove the repetitive elements.

12. Write a JavaScript program to calculate the percentage of three subjects' (English, Mathematics, and Science) marks along with the name of a student. The name and individual marks input shall be taken by form in the webpage.

13. Create a web page to take input of a string and count the number of vowels in it.

14. Create a web page to take input of two strings and concatenate them without using any built-in function.

15. Create a web page to take input of a string and then slice it in to three separate strings and display that.

16. Write a Java Script program to take two arrays like [1,3,8,1,6,2,3] and [2,1,5,6,0,-3] and merge them into third array along with that remove the repetitive elements.

17. Write a JavaScript program to calculate and display the aggregate and percentage of three subjects' (Physics, Chemistry and Mathematics) marks along with the name of a student. The name and individual marks input shall be taken by text box in the webpage.

18. Create a web page to take input of a string and check whether it is a palindrome or not.

Learning Outcomes:

The student will be able to: • Analyze a web page and identify its elements and attributes. Create web pages using XHTML and Cascading Style Sheets. Build dynamic web pages using JavaScript (Client side programming). Create XML documents and Schemas.

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BACHELOR OF COMPUTER APPLICATION (BCA)

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Semester–V

Course Content

Subject Code	Paper Name	Credit
MJ11CPS	System Analysis and Design	3

Objective:

To develop an understanding of Testing software and complying the various software quality parameters.

The objective of this course is to provide adequate understanding of systems concept, system analysis, and systems design, which would help them in having efficient and workable information system for management. To provide an understanding the role of Hardware and Software for realizing organizational Objectives and automation. To provide an understanding of the role of systems analyst and software development firms for their role in distributing meaningful ERP modules and other business intelligent system.

UNIT–I

Overview of System Analysis & Design Definition, Characteristics, System Concepts, Elements and Types. System Development Life Cycle Impetus for change, Steps involved in SDLC, People involved SDLC. Initial Investigation Background Analysis, Fact finding techniques, tools for Information gathering, types of interviews and questionnaires.

UNIT–II

Structured Analysis Definition, tools for structured analysis. Feasibility Study Definition, Considerations Technical, Economic, Behavioral & Political, Steps in Feasibility Study, Feasibility Report. Cost Benefit Analysis (CBA) Categories Hardware, Personnel, Facility, Operating and Supply Costs, Procedure for CBA Determination.

Unit–III

System Design- Definition, Process of Design, Structured Design, Elements of Functional Decomposition – Module, Connection and Coupling, HIPO and IPO Charts, Major development activities of Design stage Data Validation, Audit Trial. System Testing – Why Testing ? Factors considered for testing, Test Data & Test Plan, Phases of Testing, Types of system tests.

Unit–IV

Quality Assurance–Definition, Goals in System Life Cycle, Levels of Quality Assurance, Tresting. Implementation–Conversion, Stages of Conversion, Combating resistance to change, Post Implementation Review, Review Plan. Software Maintenance – Maintenance /Enhancement,

Activities of a Maintenance procedure, reducing maintenance costs.

Unit –V

System Security – Data Security, Threats to System Security, Risk Analysis, Control Measures, System Audit, Protection Against VIRUS. Hardware and Software Selection–Hardware/ Software Suppliers, Procedure for Hardware/Software Selection, Major Phases in Selection. Types of Software, Attributes of Software, Criteria for Software Selection, Evaluation Process. Financial Consideration in Selection–Rental, Lease, Purchase Options.

TEXTBOOKS:

1. System Analysis and Design- by Elias MAwad.
2. System Analysis & Design– by VK Jain, Dream tech Press.
3. System Analysis & Design– by Theoroff.

REFERENCEBOOKS:

1. Computers Today– by Suresh K Basandra.
2. Modern System Analysis & Design by A Hoffer, F George, S Valaciah, Low price Edn. Pearson Education.
3. Information Technology & Computer Applications–by V.K. Kapoor, Sultan Chand & Sons, New Delhi.
4. Introduction to Systems Analysis and Design–by Lee.

Learning Outcome:

Students will be able to

- Understand the life cycle of a systems development project.
- Understand the analysis and development techniques required as a team member of a medium-scale information systems development project
- Learn the effect of internet and technology on business strategies.
- Understand the importance of business communications.
- An understanding of the object-oriented methods models as covered by the Unified Modelling Language.

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SEMESTER–V

Course Content

Subject Code	Paper Name	Credit
BCA	Internship/Project Work	**SIP**

Note- A student can be allowed to do the project outside after the permission of Departmental Academic Committee.

1. Those who are doing project outside but within the same city has to present their project progress every month.

2. Those who are doing project outside the city can be permitted to present their project progress every fortnight through video conferencing.

3. Those who are doing project at home , has to present their project progress every week.

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SEMESTER–VI

Course Content

Subject Code	Paper Name	Credit
MJ12CPS	Python Programming	**3**

Python Programming

Learning Objectives:

When students complete Intro to Programming with Python, they will be able to: Build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions. Work with user input to create fun and interactive programs.

Unit–I

Introduction to Computers, Programs, and Python: Introduction, Programming Languages, Operating Systems, The History of Python, Features of python language, Getting Started with Python, Programming Style and Documentation, Programming Errors.

Elementary Programming: Introduction, Writing a Simple Program, Reading Input from theConsole,Identifiers,Variables,AssignmentStatements,andExpressions,SimultaneousAssignments, Named Constants, Numeric Data Types and Operators, Evaluating Expressions and Operator Precedence, Augmented Assignment Operators, Type Conversions and Rounding.

Unit –II

Mathematical Functions, Strings, and Objects: Introduction, Common Python Functions, Strings and Characters, Introduction to Objects and Methods, Formatting Numbers and Strings.

Control Structures: Selections: Introduction, Boolean Types, Values, and Expressions, if Statements, Two-Way if-else Statements, Nested if and Multi-Way if-elif-else Statements, Logical Operators, Conditional Expressions, Loops: Introduction, The while Loop, The for Loop, Nested Loops, Keywords break and continue

Unit–III

Functions: Introduction, Defining a Function, Calling a Function, Functions with/without Return Values, Positional and Keyword Arguments, Passing Arguments by Reference Values, Modularizing code, The Scope of Variables, Default Arguments, Returning Multiple Values.

Lists: Introduction, List Basics, Copying Lists, Passing Lists to Functions, Returning a List from a Function, Searching Lists, Sorting, Processing Two- Dimensional Lists, Passing Two-Dimensional Lists to Functions, Multidimensional Lists.

Unit–IV

Tuples, Sets, and Dictionaries: Introduction, Tuples: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Tuple methods, Sets: Creating Sets, Manipulating and Accessing Sets ,Subset and Superset, Set Operations, Comparing the Performance of Sets and Lists, Dictionaries: Creating a Dictionary, Adding, Modifying, and Retrieving Values, Deleting Items, Looping Items, The Dictionary Methods.

Unit –V

Objects and Classes: Introduction, Defining Classes for Objects, Immutable Objects vs. Mutable Objects, Hiding Data Fields, Class Abstraction and Encapsulation, Object-Oriented Thinking. Inheritance and Polymorphism: Introduction, Super classes and Subclasses, Overriding Methods, The **object** Class, Polymorphism and Dynamic Binding, The **Is instance** Function. Class Relationships: Association, Aggregation, composition.

Files and Exception Handling: Introduction, text input and output: opening a file, Writing Data, Testing a File's Existence, Reading All Data from a File, Writing and Reading Numeric Data, Binary IO Using Pickling, Exception Handling, Raising Exceptions.

TEXTBOOK

1. Y. Daniel Liang, "Introduction to programming using python", Pearson Education; First edition (2017).

REFERENCE BOOK

1. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education; Forth edition (2018)
2. Mark Lutz, "Learning Python "O'Reilly Fifth edition(2013)
3. Mark Summer field, "Programming in Python 3:A Complete Introduction to the Python Language" Pearson Education; Second edition(2018)

SEMESTER–VI

Course Content

Subject Code	Paper Name	Credit

RKDF UNIVERSITY RANCHI

BACHELOR OF COMPUTER APPLICATION (BCA)

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MJL12CPS	PYTHON PROGRAMMING LAB	**1**

List of Programs as Assignments:

1. Write a program that displays "Hello to Python programming".

2. Write a program to read two integers and perform arithmetic operations on them (addition, subtraction, multiplication and division).

3. Write a program to read the marks of three subjects and find the average of them.

4. Surface area of a prism can be calculated if the lengths of the three sides are known. Write a program that takes the sides as input (read it as integer) and prints the surface area of the prism (Surface Area= 2ab+ 2bc+2ca)

5. A plane travels 395,000 meters in 9000 seconds. Write a program to find the speed of the plane (Speed= Distance/Time).

6. You need to empty out the rectangular swimming pool which is 12 meters long, 7 meters wide and 2 meter depth. You have a pump which can move 17 cubic meters of water in an hour. Write a program to find how long it will take to empty your pool? (Volume=l*w* h, and flow =volume/time).

7. Write a program to convert temperature from centigrade (read it as float value) to Fahrenheit.

8. A car starts from a stoplight and is traveling with a velocity of 10 m/sec east in 20seconds. Write a program to find the acceleration of the car. [acc = $(V_{final} - V_{initial})$/Time].

9. Write a Program to Prompt for a Score between 0. 0 and 1. 0. If the Score Is Out of Range, Print an Error. If the Score Is between0.0 and1.0,Print a Grade Using the Following Table

Score	Grade
>= 0.9	A
>= 0.8	B
>= 0.7	C
>= 0.6	D
< 0.6	F

a. Write a Program to find the maximum of three numbers.

SEMESTER–VI

Course Content

Subject Code	**Paper Name**	**Credit**
MJ13CPS	Soft Computing	**3**

Course objectives:

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BACHELOR OF COMPUTER APPLICATION (BCA)

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The main objective of the course is *to expose the students to soft computing, various types of soft computing techniques, and applications of soft computing*. .

UNIT–I

Fuzzy Set Theory: Basic Definition and Terminology, Set Theoretic Operations, Fuzzy types and levels, MF Formulation and Parameterization, MF of two dimensions, Fuzzy Union, Intersection and Complement, Fuzzy Number, Fuzzy measure.

UNIT –II

Fuzzy Logic: Fuzzy Rules and Fuzzy Reasoning: Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Defuzzification, Fuzzy Reasoning. Fuzzy Inference System: Introduction, Mamdani Fuzzy Models, Other Variants, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models.

UNIT–III

Fundamentals of Genetic Algorithms: Basic Concepts, Creation of Off springs, Encoding, Fitness Functions, Reproduction, Genetic Modeling: Inheritance Operators, Cross over, Inversion and detection, Mutation operator, Bitwise operators.

UNIT–IV

Introduction to Artificial Neural Networks: What is a Neural Network? Human Brain, Models of Neuron, Neural Network viewed as Directed Graphs, Feedback, Network Architecture, Knowledge Representation, Learning processes: (Error correction, Memory- Based, Hebbian, Competitive, Boltzman, Supervised, Unsupervised), Memory, Adaptation.

UNIT –V

Perceptrons, Adaline, Back Propagation Algorithm, Methods of Speeding, Convolution Networks, Radical Basis Function Networks, Covers Theorem, Interpolation Learning, The Hopfield Network.

Text Books:

1. JangJ.S.R.,SunC.T.andMizutaniE.,"Neuro-FuzzyandSoftComputing"PHI/PearsonEducation,NewDelhi,2004.

2. RajasekaranS.&Vijayalakshmi,G.A.Pai,"NeuralNetworks,FuzzyLogic,andGeneticAlgorithms:SynthesisandApplications",PHI,New Delhi,2003.

3. RossT.J.,"FuzzyLogicwithEngineeringApplications",TMH,NewYork,1997.

4. HaykinsSimon,"NeuralNetworks:AComprehensiveFoundation",PearsonEducation,2002.

*Reference Books***:**

1. Ray K.S., "SoftComputingandItsapplication",Vol1, Apple Academic Press. 2015.

2. LeeK. H., "First Course on Fuzzy Theory and App.",Advin Soft Computing Spinger. 2005.

3. Zimmermann H.Z., "Fuzzy Set Theory and its App",4th Edition, Spinger Science

Subject Code	Paper Name	Credit
MJL13CPS	Soft Computing Lab	**1**

Soft Computing Lab

- Create a perceptron with appropriate number of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights.

1. Write a program to implement artificial neural network without back propagation. Write a program to implement artificial neural network with back propagation.

2. Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.

3. Implement travelling sales person problem (tsp) using genetic algorithms.

4. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on soya bins data. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.

5. Implement linear regression and multi-regression for a set of data points

6. Implement crisp partitions for real-life iris data set

7. Write a program to implement Hebb's rule

8. Write a program to implement Delta rule.

9. Write a program to implement logic gates.

10. Implements vm classification by fuzzy concepts

Reference Books*:*

D.K Prathikar, ―Soft Computing‖, Narosa Publishing House, New Delhi, 2008

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SEMESTER–VI

Course Content

Subject Code	Paper Name	Credit
MJ14CPS	Computer Graphics	**3**

Course objectives:

The course **introduces the basic concepts of computer graphics**. It provides the necessary theoretical background and demonstrates the application of computer science to graphics. The course further allows students to develop programming skills in computer graphics through programming assignments.

Unit–I

Introduction to Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Work stations, Input Devices, Hard Copy Devices, Graphics Software. Three-Dimensional Viewing Devices, Stereoscopic & Virtual Reality Systems

Unit –II

Output Primitives: Points and Lines, Line Drawing Algorithms (DDA and Bresenham's Algorithms), Loading the Frame Buffer, Circle Generating Algorithm, Filled Area Primitives – Scan-line Polygon Fill Algorithm, Boundary- Fill Algorithm, Flood- Fill Algorithm, Color Tables.

Unit–III

2D Transformation and Viewing: Basic Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transformations (Translations, Rotations, Scalings), Other Transformations (Reflection and Shear), The Viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-Viewport Coordinate Transformation, Clipping-Point, Cohen-Sutherl and Line Clipping and Suther land-Hodgeman Polygon Clipping.

Unit–IV

Three- Dimensional Geometric Transformations: Translation, Rotation, Scaling.

Unit –V

Introduction to Multimedia Systems and Multimedia Components: Multimedia Systems, Multimedia Presentation and Production, Characteristics of Multimedia Presentation, Uses of Multimedia. CD Formats, DVD, DVD Formats. Text and its File Formats, Image Types and File Formats, Fundamental Characteristics of Sound, Audio File Formats, Video, Transmission of Video Signals, Video File Formats.

TEXT BOOKS

1. Hearn D. and Baker M.P., "Computer Graphics: C Version", 2nd Edition, Pearson Education, 2007.

2. Buford J. F.K., "Multimedia Systems", 1st Edition, Pearson Education, 2005.

REFERENCE BOOKS

1. Foley J.D., Dam A. Van, Feiner S.K. and Hughes J.F., "Computer Graphics: Principles and Practice in C", 2nd Edition, Pearson Education, 2000.

2. Parekh R., "Principles of Multimedia", 2nd Edition, Tata McGraw Hill, 2012.

Learning Outcomes:

a) Understand the basics of computer graphics, different graphics systems and applications of computer graphics.

b) Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.

c) Use of geometric transformations on graphics objects and their application in composite form.

d) Extract scene with different clipping methods and its transformation to graphics display device.

e) Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.

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Semester–VI

Course Content

Subject Code	Paper Name	Credit
MJL14CPS	Computer Graphics Lab	**1**

Computer Graphics Lab using C++

- Write a program to draw basic shapes.

- Write a program to draw basic shapes.

- Write a program to draw three concentric circles of increasing order.

- Write a program to generate circles on the screen randomly.

- Write a program to print a line using DDA Algorithm.

- Write a program to print a line using Bresenham's Line Drawing Algorithm.

BACHELOR OF COMPUTER APPLICATION (BCA)
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SEMESTER–VI

Course Content

Subject Code	Paper Name	Credit
MJ15CPS	Management Information System	**4**

Course objectives:

To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.

Unit – I

Information Systems in Global Business Today: The role of Information System in Business Today, How Information Systems Are Transforming Business, What's New in Management Information Systems?, Globalization Challenges and Opportunities: A Flatted World, The Emerging Digital Firm, Strategic Business Objectives of Information Systems, Perspectives on Information Systems, What is an Information System?, Dimensions of Information Systems, It Isn't Just Technology: A Business Perspective on Information Systems.

Unit –II

E-Business: How Businesses Use Information Systems: Business Processes and Information Systems, Business Processes, How Information Technology Enhances Business Processes, Types of Information Systems, Transaction Processing Systems, Management Information Systems and Decision-Support Systems, Systems That Span the Enterprise, Enterprise Applications, Intranets and Extranets, Collaboration and Communication Systems: "Interaction" Jobs in a Global Economy, E-Business, The Information Systems Function in Business.

Unit–III

Information Systems, Organizations, and Strategy: Organizations and Information Systems, What Is an Organization?, Features of Organizations, How Information Systems Impact Organizations and Business Firms, Economic Impacts, Organizational and Behavioral Impacts, The Internet and Organizations, Implications for the Design and Understanding of Information Systems, Using Information Systems to Achieve Competitive Advantage ,Porter's Competitive Forces Model.

Unit–IV

IT Infrastructure and Emerging Technologies: IT Infrastructure, Defining IT Infrastructure, Evolution of IT Infrastructure, Technology Drivers of Infrastructure Evolution, Infrastructure Components, Computer Hardware Platforms, Operating System Platforms, Enterprise Software

Applications, Data Management and Storage, Networking/ Telecommunication Platforms, Internet Platforms, Consulting and System Integration Services, Contemporary Hardware Platform Trends, The Emerging Mobile Digital Platform, Grid Computing, Cloud Computing and the Computing Utility, Autonomic Computing.

Unit –V

Enhancing Decision Making: Decision Making and Information Systems, Business Value of Improved Decision Making, Types of Decisions, The Decision Making process, Managers and Decision Making in The Real World, Systems for Decision Support, Management Information System(MIS), Decision-Support Systems (DSS), Web- Based Customer Decision- Support Systems, Group Decision-Support Systems (GDSS), Executive Support Systems(ESS).

Case Studies: Two Recent Case Studies to be Discussed Fully Covering the Whole Syllabus.

TEXT BOOK

1. Laudon K.and Laudon J., "Management Information Systems", Prentice Hall Publication.

REFERENCE BOOKS

1. Murdick, Rossand Claggett,"Information Systems for Modern Management", PHI Publication.

2. Jawadekar W.S., "Management Information Systems", Tata Mc Graw Hill Publication.

3. Goyal D.P., "Management Information Systems Managerial Perspectives", Macmillan India Ltd.

Learning Outcome:

Upon completion of this course, students will be able to:

1. Relate the basic concepts and technologies used in the field of management information systems;

2. Compare the processes of developing and implementing information systems.

3. Outline the role of the ethical, social, and security issues of information systems.

4. Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.

5. Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization

SEMESTER–VII

Course Content

Subject Code	Paper Name	Credit
MJ16CPS	Data Mining	**3**

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Course Objective:

This course will introduce the concepts of data ware house and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

UNIT–I

Introduction: What is data mining? Motivating challenges. The origins of data mining. Data mining tasks. Data: Types of Data. Attributes and Measurement. Types of Data Sets. Data Quality Measurement and Data Collection Issues.

UNIT –II

Measures of Similarity and Dissimilarity: Basics. Similarity and Dissimilarity between Simple Attributes. Dissimilarities between Data Objects. Similarities between Data Objects . Examples of Proximity Measures. Issues in Proximity Calculation. Selecting the Right Proximity Measure.

UNIT–III

Association Analysis: Basic Concepts and Algorithms Preliminaries. Frequent Item set Generation. The Apriori Principle. Frequent Item set Generation in the Apriori Algorithm. Candidate Generation and Pruning Support Counting. Rule Generation.

UNIT–IV

Cluster Analysis: Basic Concepts and Algorithms. What Is Cluster Analysis? Different Types of Clustering. Different Types of Clusters. K- means. Basic K- means Algorithm. Basic Agglomerative Hierarchical Clustering Algorithm. Key Issues in Hierarchical Clustering. The DBSCAN Algorithm.

UNIT –V

Classification: Basic Concepts and Techniques. General Framework for Classification. Decision Tree Classifier. A Basic Algorithm to Build a Decision Tree. Methods for Expressing Attribute Test Conditions. Measures for Selecting an Attribute Test Condition. Algorithm for Decision Tree Induction. Characteristics of Decision Tree Classifiers. Model Evaluation.

TEXT BOOK

1. Tan Pang - Ning, Steinbach Michael, and Kumar Vipin, "Introduction to Data Mining", Pearson Education, New Delhi.

REFERENCE BOOKS

1. Han Jiawei & Kamber Micheline, "Data Mining Concepts & Techniques", Publisher Harcourt India. Private Limited, Second Edition

2. Dunham H.M. & Sridhar S., "Data Mining", Pearson Education, New Delhi, 2006.

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<u>**COURSE OUTCOME**</u>:

1 Understand the functionality of the various data mining and data warehousing component.

2 Appreciate the strengths and limitations of various data mining and data warehousing models.

Course Content

Subject Code	Paper Name	Credit
MJL16CPS	Data Mining Lab	**1**

List Of Experiments:

1. Concept Design with E-R Model
1. Relational Models
2. Normalization
3. Practicing DDL Commands
4. Practicing DML Commands
5. Querying (using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT, Constraints Etc.)
6. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
7. Triggers (Creation of insert trigger, delete trigger, update trigger)
8. Procedures
9. Usage of Cursors
10. Case Study: Book Publishing Company
11. Case Study: General Hospital
12. Case Study: Car Rental Company
13. Case Study: Student Progress Monitoring System

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SEMESTER–VII

Course Content

Subject Code	Paper Name	Credit
MJ17CPS	Machine Learning	**4**

Machine Learning

UNIT-I

Introduction to Machine learning Machine Learning – what and why? Basics of Linear Algebra and Statistics, Overview of target function representations; Linear Regression.

UNIT-II

Supervised Learning Basics of Feature Selection and Evaluation, Decision Tree, Over fitting and Pruning, Page 238 of 439 Logistic regression, Support Vector Machine and Kernel; Noise, bias-variance trade-off, under-fitting and over-fitting concepts.

UNIT-III

Neural Networks Perceptions: representational limitation and gradient descent training. Multi layer networks and back propagation. Hidden layers and constructing intermediate, distributed representations. Over fitting, learning network structure, recurrent networks.

UNIT-IV

Unsupervised and Semi Supervised Learning from un classified data. Clustering. Hierarchical Agglomerative Clustering. kmeans partitional clustering. Expectation maximization (EM) for soft clustering. Semi supervised learning with EM using labeled and unlabeled data.

UNIT-V

Ensemble Committees of multiple hypotheses, bagging, boosting, active learning with ensembles,

Text book:

1. Mitchell Tom, Machine Learning, Latest Edition, Mc-Graw Hill.

Reference books:

1. Shalev-Shwartz Shaiand Ben-David Shai, Understanding Machine Learning, Cambridge University Press. 2017.

2. Bishop Christopher, Pattern Recognition and Machine Learning, Springer, 2006.

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BACHELOR OF COMPUTER APPLICATION (BCA)
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SEMESTER–VII

Course Content

Subject Code	Paper Name	Credit
MJ18CPS	Distributed Database System	**3**

Course objective:

- This course covers the fundamental issues of distributed databases with focus on data fragmentation and allocation, query optimization and transaction processing.
- Topics include: Distributed database management systems architecture and design;
- data fragmentation, replication, and allocation; database security, authorization and integrity control; query optimization; transaction management; distributed concurrency control and replica control; distributed object database management systems; multi database systems.

Unit-I:

Introduction: Distributed Data Processing, What is a Distributed Database System? Promises of DDBSs, Problem Areas.

Unit-II:

Distributed DBMS Architecture: DBMS Standardization, Architectural Models for Distributed DBMSs, Distributed DBMS Architecture.

Distributed Database Design: Alternative Design Strategies, Distribution Design Issues, Fragmentation, Allocation.

Unit-III:

Overview of Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations, Layers of Query Processing.

Query Decomposition and Optimization: Query Decomposition, Query Optimization, Centralized Query Optimization, Distributed Query Optimization Algorithms.

Unit-IV:

Transaction Management and Concurrency Control: Definition of a Transaction, properties of Transactions, Serializability Theory, Taxonomy of Concurrency Control Mechanisms, Locking-based Concurrency Control Algorithms, Timestamp-based Concurrency Control Algorithms, Deadlock Management.

Unit-V:

Distributed DBMS Reliability: Reliability Concepts and Measures, Failures and Fault Tolerance in Distributed Systems, Failures in Distributed DBMS, Local Reliability Protocols, Distributed

Reliability Protocols.

TEXT BOOK

1. Ozsu M. Tamer, Valduriez Patrick, "Distributed Database Systems", 2nd Edition, Pearson, 2011.

REFERENCE BOOKS

1. Nava the lmasri, "Fundamental of Database Systems", 5th Edition, Pearson Education, 2008.

2. Connolly Thomas, Begg Carolyn, "Database Systems–A Practical Approach to Design, implementation and Management", 4th Edition, Pearson Education, 2008.

3. Silberschatz, Korth, & Sudarshan, "Database System Concepts", 4th Edition, McGraw Hill, 2002.

Course Learning Outcomes:

Understand distributed database systems architecture and design. Be able to apply methods and techniques for distributed quey processing and optimization. Understand the broad concepts of distributed transaction process. Understand the basic concepts of Data warehousing and OLAP technology.

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SEMESTER–VII

Course Content

Subject Code	Paper Name	Credit
MJ19CPS	Network Security	**4**

UNIT-I

Introduction to Cryptography: Computer Security concepts, The OSI Security Architecture, Security Attacks, Security Services, A model for Network Security, Classical Encryption Techniques.

UNIT-II

Mathematical Foundations of Cryptography: Modular Arithmetic, Euclidean Algorithm, Groups, Rings, Fields, Finite Fields of the Form GF(p), Polynomial Arithmetic, Finite Fields of the Form GF(2n), Prime Numbers, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Quadratic Congruence, Discrete Logarithms.

UNIT-III

Symmetric and Asymmetric Cryptography: Difference Between Symmetric and Asymmetric Cryptography, DES, Triple DES, AES, RSA Cryptosystem, Symmetric and Asymmetric Key Cryptography Together, Elgamal Cryptosystem, Elliptic Curve Cryptosystems, , Diffie- Hellman Key Exchange , Cryptographic Hash Functions, Message Authentication Codes, Digital Signature.

UNIT-IV

Internet Security Protocols : Basic Concepts, Security Socket Layer (SSL), Secure Hyper Text Transfer Protocol (SHTTP), Time stamping Protocol(TSP), Secure Electronic Transaction(SET),SSL Versus SET, 3-D Secure Protocol, Electronic Money, Email Security, Wireless Application Protocol(WAP) Security, Security in GSM.

UNIT-V

Network Security: Users, Trusts and Trusted Systems, Buffer Overflow and Malicious Software, Malicious Programs, Worms, Viruses, Intrusion Detection Systems (IDS), Firewalls: Definitions, Constructions and Working Principles.

Text Book:

1. Forouzan B.A., Mukhopadhyay D., "Cryptography and Network Security", 3rd Edition, Mcgraw Higher Education, 2016.

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Reference Books:

1. Stallings W., "Cryptography and Network Security: Principles and Practice", 7th Edition, Pearson, 2017.

2. Kahate A.,"Crptography and Network Security", 3rd Edition, McGraw Hill Education, New Delhi, 2013.

3. Schneier B., "Applied Cryptogaphy: Protocols, Algorithms And Source Code In C", 2nd Edition,Wiley, 2007.

SEMESTER–VIII

Course Content

Subject Code	Paper Name	Credit
MJ20CPS	Distributed Computing	**4**

DISTRIBUTEDCOMPUTING

Course Objective:

This course is an introduction to the design of distributed systems and algorithms that support distributed computing. It aims to provide a practical exposure into the design and functioning of existing distributed systems.

Unit–I

Distributed Computing Concept: Definitions, The history of distributed computing, Different forms of computing, the strengths & weaknesses of distributed computing, Basics of operating systems, Network basics, Software engineering basics. Event synchronization, Timeouts and threading, Deadlocks, Data representation, Data marshaling, Event diagram and sequence diagram, IPv4 & IPv6, Connection–oriented versus connectionless IPC.

Unit –II

Distributed Computing Paradigms: Paradigms and Abstraction, Message Passing, The Client-Server Paradigm, the Message System Paradigm, Remote Procedure Call Model, RMI, The Distributed Objects Paradigm, The Object space, The Mobile Agent Paradigm.

Unit–III

The Socket API: The Socket metaphor in IPC, The Datagram Socket API, The Stream-Mode Socket API, Sockets with non blocking I/O Operations, Secure Socket API. The client server paradigm issuers, connection-oriented and connectionless servers, Iterative server and concurrent server, stateful server and stateless server.

Unit–IV

Distributed Objects: Remote Procedure Calls, Distributed Objected Systems, Remote Method Invocation, The Java RMI Architecture, The API for the Java RMI, RMI Security Manager, Comparison of RMI ,Remote Procedure Calls, Distributed Objected Systems, Remote Method Invocation, The Java RMI Architecture, The API for the Java RMI, RMI Security Manager, Comparison of RMI and Socket APIs.

Unit –V

Group Communication: Unicasting versus Multicasting, Multicast API, Connectionless versus Connection-oriented Multicast, Reliable Multicasting versus Unreliable Multicasting, The Java Basic Multicast API.

TEXT BOOK

1. Liu M.L., "Distributed Computing: Principles and Application", Pearson Education, 2008.

REFERENCE BOOK

1. Altiya H., Welch J., "Distributed Computing Fundamentals, Simulations and Advanced Topics",2nd edition, Wiley– India Edition,2006.

Course Outcomes:

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

Understand the design principles in distributed systems and the architectures for distributed systems

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SEMESTER–VIII

Course Content

Subject Code	Paper Name	Credit
AMJ01CPS	Advanced Database Management System	**3**

Objective

- To understand the basic concepts and terminology related to DBMS and Relational Database Design
- To the design and implement Distributed Databases.
- To understand advanced DBMS techniques to construct tables and write effective queries, forms, and reports

Unit I

Formal review of relational database and FDs Implication, Closure, its correctness

Unit II

3NF and BCNF, Decomposition and synthesis approaches, Review of SQL99, Basics of query processing, external sorting, file scans

Unit III

Processing of joins, materialized vs. pipelined processing, query transformation rules, DB transactions, ACID properties, interleaved executions, schedules, serialisability

Unit IV

Correctness of interleaved execution, Locking and management of locks, 2PL, deadlocks, multiple level granularity, CC on B+ trees, Optimistic CC

Unit V

T/O based techniques, Multi-version approaches, Comparison of CC methods, dynamic databases, Failure classification, recovery algorithm, XML and relational databases

Outcome

- Exposure for students to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries.
- Knowhow of the file organization, Query Optimization, Transaction management, and database administration techniques

Text Books

1. R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw Hill, 2004
2. A. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008.

Reference Books

1. K. V. Iyer, Lecture notes available as PDF file for classroom use.

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SEMESTER–VII

Course Content

Subject Code	Paper Name	Credit
AMJL01CPS	Advanced Database Management System Lab	**1**

List of Experiments

o Concept Design With E-R Model

- Relational Model

- Normalization

- Practicing DDL Commands

- Practicing DML Commands

- Querying (using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT, Constraints Etc)

- Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.

- Triggers (Creation of insert trigger, delete trigger, update trigger)

- Procedures

- Usage of Cursors

- Case Study: Book Publishing Company

- Case Study: General Hospital

- Case Study: Car Rental Company

- Case Study: Student Progress Monitoring   System

Subject Code	Paper Name	Credit
AMJ02CPS	Distributed Operating System	**3**

Objective:

Emphasis would be to provide the knowledge of communication, synchronization, resource management and security aspect in distributed operating system.

Prerequisite of course: Operating System, Computer Network

Unit 1

Introduction of Distributed Operating System (DOS), Functions of DOS, Basic concepts, goals & challenges of distributed systems, architectures of DOS. Revisit the inter process communication. 06

Unit 2

Communication in DOS : Study of case studies for distributed environment, Issues in communication, message-oriented communication, remote procedure call, remote method invocation, stream-oriented Syllabus for Bachelor of Technology Computer Engineering communication, communication between processes, unstructured Vs structured communication, blocking Vs non-blocking communication.

Unit3

 Synchronization: Introduction of synchronization, Clocks, events, Time in distributed systems 1. Cristian's algorithm 2.The Berkeley Algorithm, 3. Network Time Protocol (NTP) 4.Logical time and logical clocks 5.Lamport logical clock 6.vector clock

Unit4

 Transaction and Concurrency Control: Basic concurrency control mechanism in DOS mutual exclusion in distributed environment, Transactions and Concurrency Control in distributed environment, distributed deadlocks in distributed environment.

Unit 5

Distributed and Shared Memory Management(DSM): Basic fundamentals of shared memory in DOS, Architecture and algorithm of distributed shared memory, advantages & challenges of DSM, Memory coherence, consistency model, consistency with uniprocessor system, consistency with multiprocessing environment.

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Unit 6

Resource Management in DOS: Types of resources, issues of resource sharing, Task assignment, Types of distributed load balancing algorithms, load estimation policy, process transfer, location policy, state information exchange policy, priority assignment policy, process migration and case studies.

Unit7

Security in DOS: Importance of security, Types of external attacks, Basic elements of Information System security and policy, Trust Management, Access control models, cryptography. 08 8 Case study: Andrew Network file system, SUN Network File system. 04 TOTAL 5

Course Outcomes:

After the completion of this course, student will be able to

 • Gain knowledge of distributed operating system architecture (Knowledge)

• Illustrate principles and importance of distributed operating system (Understand)

 • Implement distributed client server applications using remote method invocation (Apply)

 • Distinguish between centralized systems and distributed systems (Analyze)

 • Create stateful and state-less applications (Create)

SEMESTER–VIII

Course Content

Subject Code	Paper Name	Credit
AMJL02CPS	Distributed Operating System Lab	**1**

List of Experiments

EXPERIMENT-1 Implement concurrent echo client-server application.

EXPERIMENT-2 Implement concurrent day-time client-server application.

EXPERIMENT-3 Configure following options on server socket and tests them: SO_KEEPALIVE,

SO_LINGER, SO_SNDBUF, SO_RCVBUF, TCP_NODELAY

EXPERIMENT-4 Incrementing a counter in shared memory.

EXPERIMENT-5 Create CORBA based server-client application

EXPERIMENT-6 Design XML Schema and XML instance document

EXPERIMENT-7 WSDL based: Implement Arithmetic Service that implements add, and subtract

operations / Java based: Implement Trigonometric Service that implements sin, and cos operations.

EXPERIMENT-8 Configuring reliability and security options

EXPERIMENT-9 Monitor SOAP request and response packets. Analyze parts of it and compare

them with the operations (java functions) headers.

EXPERIMENT-10 Design and test BPEL module that composes Arithmetic Service and

Trignometric Service.

EXPERIMENT-11 Test open source ESB using web service.

LABWORK BEYOND CURRICULA

EXPERIMENT-12 Implementing Publish/Subscribe Paradigm using Web Services, ESB and JMS

EXPERIMENT-13 Implementing Stateful grid services using Globus WS-Core.

SEMESTER–VIII

Course Content

Subject Code	Paper Name	Credit
AMJ03CPS	Internet of Things	**3**

UNITI

Introduction to IOT The definition of the Internet of Things, main assumptions and perspectives.

Platform for IoT devices Device architectures. Conventional and renewable power sources for

resource constrained devices. Operating systems for resource-constrained devices.

UNITII

Architecture of IOT Node structure: Sensing, Processing, Communication, Powering IOT networking: Topologies, Layer/ Stack architecture, The data link layer for IoT- Wireless communication technologies. Wire communication technologies. Manet Networks.

UNIT-III

Communication Technologies Introduction to ZigBee, BLE, WiFi, LTE, IEEE 802.11ah, Discuss data rate, range, power, computations /bandwidth, QoS, Service oriented protocols(COAP). Communication protocols based on the exchange of messages (MQTT). Service discovery protocols.

UNIT-IV

M2MandIoTTechnologyFundamentalsDevicesandgateways,Localandwideareanetworking,Datamanagement, Business processes in IoT, Everything as a Service(XaaS), M2M and Io TAnalytics, Knowledge Management.

UNIT-V

The data processing for IoT Organization of data processing for the Internet of things. Cloudcomputing. Fog computing. Application case studies: Smart Grid. Home Automation. Smart City.

Textbooks:

1. Madisetti Vijay and Bahga Arshdeep, Internet of Things (A Hands-on Approach), 1 st Edition,VPT,2014.

2. Raj Pethuru and Raman Anupama C., The Internet of Things: Enabling Technologies, Platforms, and Us Cases,CRC Press.

REFERENCE BOOKS:

1. Vermesan Dr. Ovidiu, Friess Dr. Peter, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers.

2. Holler Jan, Tsiatsis Vlasios, Mulligan Catherine, Avesand Stefan, Karnouskos Stamatis, Boyle David, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence,1stEdition,Academic Press,2014.

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MINOR

SEMESTER I/ III/ V/ VII

SEMESTER I

Course Content

Subject Code	Paper Name	Credit
MN01CPS	Digital Electronics	**3**

Course Objectives:

This course introduces students to the principles of digital computer design, particularly the fundamentals of modern digital logic design including logic gates, Boolean algebra, Karnaugh maps, flip-flops, and state-machines. It examines the binary number system, hexadecimal notation and computer arithmetic. This exploration of "low level" computing is complemented by an introduction to the basic elements of a modern computer, its organization and architecture. In addition, students are introduced to assembly and machine language programming.

Unit I

Representation of information, Number System: Binary, Octal, Hexadecimal, Conversions from one base to another base, Binary Arithmetic, Unsigned binary number, signed magnitude number, Complement representation, 2's complement arithmetic, ASCII Code, BCD Code, EBCDIC Code, Excess-3 Code and Gray Code

Unit-II

Basic logic designs: Logic gates AND, OR, NOT, NOR, NAND, xO R gates and their Truth Tables, Boolean algebra, Minimization techniques, Karnaugh map, sOP and POS forms, Combinational circuit design with gate: multiplexers & de multiplexers, Encoder- Decoder, Adders and Sub tractors, Flip flops: RS, JK, Master slave flip flops, Introduction to counters and registers.

Unit-III

Memory: Memory cell, Primary memory-RAM, ROM, PROM, EPROM, EEPROM, Cache memory, Secondary Memory and its types, Introduction to physical memory and Virtual memory, memory accessing methods: serial and random access

Unit -IV

Buses, Word Length of a Computer, Processing speed of a computer, Microprocessor, User Interface, Hardware, Software and Firmware concepts, General architecture of CPU, Instruction

Format, Data transfer instructions, Data Manipulation instructions, Program control instructions. Types of CPU organization: Accumulator based machine, Stack based machine and general. Purpose register based machine, addressing modes: Direct, indirect, immediate, register and relative addressing modes.

Unit-V

Data transfer schemes: (1) Programmed data transfer-synchronous, asynchronous and interrupt driven data transfer scheme, (2) Direct memory access data transfer

TEXT BOOKS:

1. Digital Principles and applications by Malvino & Leach

2. Computer Fundamentals and Architecture by B.Ram

REFERENCE BOOKS:

1. Computer System Architecture by M Morris Mano

2. Digital Computer Electronics by Malvino & Brown

3. Digital Computer Fundamentals by Bartee.

LEARNING OUTCOME:

On successful completion of the course students will be able to:

1. Solve problems using binary numbers, hexadecimal and octal notation, and the representation of information using digital codes.

2. Solve problems using computer arithmetic including signed number representations in 1's and 2's complement form.

3. Employ logic gates, Boolean algebra and truth tables to represent combinational logic circuits.

4. Apply algebraic manipulation and Karnaugh maps to simplify combinational logic expressions.

5. Formulate solutions to real-world problems using discrete digital components, medium-scale integrated circuits, and software tools.

6. Discuss the fundamentals of computer architecture and its interaction with software.

7. Write low level assembly language.

SEMESTER I

Subject Code	Paper Name	Credit
MNL01CPS	Digital Electronics Lab	**1**

Course Objectives:

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This course introduces students to the principles of digital computer design, particularly the fundamentals of modern digital logic design including logic gates, Boolean algebra, Karnaugh maps, flip-flops, and state-machines. It examines the binary number system, hexadecimal notation and computer arithmetic. This exploration of "low level" computing is complemented by an introduction to the basic elements of a modern computer, its organization and architecture. In addition, students are introduced to assembly and machine language programming.

List of Experiments

1. Binary and BCD Counter

2. Parity Generator

3. Multiplexer/ Demultiplexers

4. Adder/ Subtractor

5. Code Converters

6. Up/Down 4 bit Binary Counter

7. Up/Down 4 bit Decimal Counter

8. Shift Register

9. Ring Counter

LEARNING OUTCOME:

On successful completion of the course students will be able to:

1. Solve problems using binary numbers, hexadecimal and octal notation, and the representation of information using digital codes.

2. Solve problems using computer arithmetic including signed number representations in 1's and 2's complement form.

3. Employ logic gates, Boolean algebra and truth tables to represent combinational logic circuits.

4. Apply algebraic manipulation and Karnaugh maps to simplify combinational logic expressions.

5. Formulate solutions to real-world problems using discrete digital components, medium-scale integrated circuits, and software tools.

6. Discuss the fundamentals of computer architecture and its interaction with software.

7. Write low level assembly language.

8. Briefly describe the role assemblers and compilers have in converting source code into machine code.

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SEMESTER–III
Course Content

Subject Code	Paper Name	Credit
MN03CSP	Discrete Mathematics	**4**

Course Objectives:

The main objectives of the course are to: • Introduce concepts of mathematical logic for analyzing propositions and proving theorems. • Use sets for solving applied problems, and use the properties of set operations algebraically. • Work with relations and investigate their properties. • Investigate functions as relations and their properties. • Introduce basic concepts of graphs, digraphs and trees.

UNIT – I

Sets and Propositions: Sets, Operations of sets, Finite and Infinite sets, Principle of inclusion and exclusion, Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, Universal and Existential Quantifiers, Normal forms, Mathematical Induction.

Unit – II

Relations and Functions: Relations, Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence relations. Functions, Types of functions, Composition of functions, Invertible functions. Permutations and Combinations, Pigeonhole Principle, Recurrence Relation.

Unit – III

Partially Ordered Sets: Introduction, Elements of Partially Ordered Sets, Lattices.

Unit – IV

Graph Theory and Trees: Basic terminology, representation of a graph in computer memory, Relations and Digraphs, Paths in Relations and Digraphs, Shortest path in weighted graphs (Dijkstra's algorithm). Basic terminology and characterization of trees, Tree traversal, Spanning trees, Minimal Spanning trees (Introduction).

Unit – V

Groups, Rings and Fields: Groups, Semi Groups, Monoids, Subgroups, Isomorphism and Homomorphism and Normal Subgroups, Rings, Integral Domain, Rings Homomorphism, Polynomial Rings, Fields.

Text Books:

- Kolman B., Bus by R. and Ross S. "Discrete Mathematical Structures",6th Edition,
- Pearson Education, 2002, ISBN 81-7808-556-9.

- Deo N.,"Graph Theory with application to Engineering and Computer Science",

- Prentice Hall of India, 1990, 0 – 87692–145 – 4.

- Johnsonbaugh R.,"Discrete Mathematics",5th Edition,

- Pearson Education, 2001 ISBN 81 –7808– 279 – 9.

Reference Books:

1. Biggs N., "Discrete Mathematics",3rd Edition, Oxford University Press, ISBN 0–19 –850717 –8.

2. Rosen Kenneth H., "Discrete Mathematics and its Applications", 6th edition, McGraw-Hill, 2007, ISBN 978-0-07-288008-3.

3. Lipschutz Semyour & Lipson Marc, "Discrete Mathematics", McGraw-Hill, 3rd Special Indian Edition, ISBN-13:978-0-07-060174-1.

4. LiuC.L. and Mohapatra D.P., "Elements of Discrete Mathematics", Si E Edition, Tata McGraw-Hill, 2008, ISBN10:0-07-066913-9.

5. Lipschutz S. and Lipson M., Schaum's Outline of Discrete Mathematics, Revised Third Edition, Tata McGraw Hill, 2010.

6. MottJ. L., KandelA. And Baker T.P., Discrete Mathematics for Computer Scientists and Mathematicians, 2nd Edition, Prentice Hall of India, 2001.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Analyze logical propositions via truth tables.

- Prove mathematical theorems using mathematical induction.

- Understand sets and perform operations and algebra on sets.

- Determine properties of relations, identify equivalence and partial order relations, sketch relations.

- Identify functions and determine their properties.

- Define graphs, digraphs and trees, and identify their main properties.

- Evaluate combinations and permutations on sets.

SEMESTER V

Course Content

Subject Code	Paper Name	Credit
MN05CPS	Computer Oriented Numerical Methods	**3**

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Course objectives:

Understanding and Learning of numerical methods for numerical analysis. Understanding the implementation of numerical methods using a computer. Learning of tracing errors in Numerical methods and analyze and predict it. Learning of application of Statistical methods.

UNIT-I

Errors in Numerical Calculations: Numbers and their accuracy, Errors and their Computations- Absolute, Relative and Percentage, General Error Formula. Solution of Algebraic and Transcendental Equations: Introduction, Bisection method, Iteration method, Method of False Position, Newton-Raphson method.

UNIT-II

Interpolation: Introduction, Errorsin Polynomial Interpolation, Finite Differences Forward, Backward Difference tables, Differences of a Polynomial, Newton's formulae for Interpolation, Lagrange's Interpolation Formula, Divided Differences and their properties- Newton's General Interpolation Formula, Inverse Interpolation.

UNIT-III

Numerical Differentiation and Integration: Introduction, Numerical Differentiation and Errors, Numerical Integration–Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8Rule.

UNIT-IV

Numerical Solution of Linear System of Equations: Direct Methods- Matrix Inversion Method, Gauss-Jordan Method, Gauss Elimination Method.

UNIT-V

Numerical Solution of Ordinary Differential Equations: Solution by Taylor's Series, Euler's method, Modified Euler's method, Runge-Kutta method of 2nd order.

Text/References:

1. S.S. Sastry-Introductory methods of Numerical Analysis, 4th Edition, Prentice Hall of India, New Delhi, 2006
2. V.N.Vedamurthyet.al.-Numerical Methods, Vikas Publishing House, New Delhi, 2005.
3. B.S. Grewal-Numerical Methods in Engineering & Science, Khanna Publishers, Delhi, 2005.
4. S.C. Gupta and, V.K. Kapoor–Elements of Mathematics, Statistics, Sultan Chand and Sons.

Learning Outcome:

The course will enable the students to

Obtain an intuitive and working understanding of numerical methods for the basic problems of numerical analysis.

Gain experience in the implementation of numerical methods using a computer.

Trace error in these methods and need to analyze and predict it.

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BACHELOR OF COMPUTER APPLICATION (BCA)

New Scheme Based on NEP - 2020

Subject Code	Paper Name	Credit
MNL05CPS	Computer Oriented Numerical Methods - LAB	**1**

Course objectives:

Understanding and Learning of numerical methods for numerical analysis. Understanding the implementation of numerical methods using a computer. Learning of tracing errors in Numerical methods and analyze and predict it. Learning of application of Statistical methods

Assignment1

Write a program in C to solve the equation $x^4+x^2-1=0$, correct to eight decimal places using bisection method.

Assignment 2

Write a program in C to find the root (which lies between 2 and 3) of the following equation correct to six significant figures using bisection method: $x^2-5\log_{10}(5x^2+2x+3)=0$

Assignment 3

Write a program in C to find the root of the equation $x^3 - 4x^2+ 10x - 10 = 0$ correct to six significant figures using Regula-Falsi Method.

Assignment 4

Write a program in C to find the root (which lies between 1 and 2) of the following equation correct to six decimal places using Regula- Falsi Method and the method of Bisection. Compare the number of iterations required in both the cases:

2x–3cosx=1.85

Assignment 5

Write a program in C to find root of the equation correct to seven significant figures.

$x^3\square8x\square4$ using Newton-Raphson method

Assignment 6

Write a program in C to solve the equation 3x–cosx-1=0, by the method of Iteration, for the root lying between 0 and 1, correct to 6 decimal places.

Assignment 7

Write a program in C to compare the rate of convergence of the Newton-Raphson method, Regula-Falsi method and the method of Bisection to find the root of the equation 2xsinx=cosx lying between 0 and 1.

Assignment 8

Write a program in C to compute a difference table for the following data and hence find the

valueof$\Box^p y$

$\Box^p y$

and$q$;p and q are to be taken from the users.

X	0.30	0.32	0.34	0.36	0.38	0.40
Y	1.7596	1.7698	1.7804	1.7912	1.8024	1.8139

Assignment 9

Write a program in C to find f(2.02) having given the following table, using Newton's forward Interpolation formula correct to five significant figures.

X	2.0	2.2	2.4	2.6	2.8	3.0
f(x)	0.30103	0.34242	0.38021	0.41497	0.44716	0.47721

Assignment10

Write a program in C to find f(2.91) having given the following table, using Newton's Inter polation formula, correct to five significant figures.

X	2.0	2.2	2.4	2.6	2.8	3.0
f(x)	0.30103	0.34242	0.38021	0.41497	0.44716	0.47721

Assignment 11

Write a program in C to find the missing element in the following table:

X	22	25	28	31	34	37
f(X)	14	27	35	?	50	65

Assignment 12

Write a programin C to find the value of X when it is given that f(X)=55 in the table given in Assignment 11 after finding the value off (31).

Assignment 13

Solve by Gausselimination method with partial pivoting, the following system of equations

Correct up to four significant figures.

$x + 3y = 2z = 52x - y + z = -1x + 2y + 3z = 2$

Assignment 14

Find the inverse of the following matrix by Gauss- Jordan method.

$$\begin{matrix} 5 & 3 & 7 \\ 1 & 5 & 2 \\ 7 & 2 & 10 \end{matrix}$$

Hence find there the following system of equations correct upto five decimal places: $5x + 3y + 7z = 5$

$x + 5y + 2z = -17x + 2y + 10z = 5$

Assignment 15

Solve, by Gauss-Jacob I iterative method, the following system of equations correct up to four significant figures.

$4.50x + 0.15y + 0.30z = 1.57$

$0.15x - 10.50y + 0.45z = -3.86$

$0.45x + 0.30y - 15.00z = 14.28$

Assignment 16

Solve, by Gauss-Seideliteration method, the following system of equations, correct up to four significant figures.

$6.32x - 0.73y - 0.65z + 1.06t = 2.95$

$0.89x + 4.32y - 0.47z + 0.95t = 3.36$

$0.74x + 1.01y + 5.28z - 0.88t = 1.97$

1.13x–0.89y+0.61z+5.63t=4.27

Assignment 17

Write aprogram in C to calculate the approximate value of the following definite integrals using

Trapizoidal rule**,** taking 20 Sub intervals, correct up to 6 significant Figures. Calculate the

Percentage of error present in the result for (i).

(i) $\int_1^3 (11 + 4x + 5x^2)dx$

(ii) $\int_0^{0.5} \sqrt{\dfrac{1 - 0.75x^2}{1 - x^2}}\,dx$

Assignment18

Write a program in C to calculate the approximate valueof

$$\int_0^{0.5} \frac{dx}{(1-x^2)(1-0.75x^2)}$$ correctup

to 7 significant figures, using Simpson's1/3 rule**,** taking 30 sub intervals.

Assignment 19

1 Write a program in C to calculate the approximate value of $\int_0$

$$\frac{dx}{x^2-2x+3}$$ correctupto4

significant figures, using Simpson's1/3 rule and Trapizoidal rule**,** taking 18 subintervals. Compare

the results by calculating percentage error. (Assume the result correct upto 7 significant digits as the

exact value.)

Assignment 20

3 Write a program in C to calculate the approximate value of

2 $\sqrt{}$ correctupto6

Significant figures, using Simpson's3/ 8 rule.

Assignment21

Write a program in C to compute y(1.0), correct upto 7 significant figures, by Euler'smethod

$$\frac{dy}{dx} = \square \qquad \frac{y}{1+x}$$;y(0.2)=2**,** taking step length h=0.01.

Assignment 22

Write a program in C to computey (1.0), correct upto 5 significant figures and Modified Euler's
method from the following differential equation:

$\frac{dy}{dx} = 1+x+x^2$;y(0)=1,

dx by Euler's method

taking step length h=0.25. Compare the results (approximate values) obtained in both the cases with
the exact value.

Assignment 23

Write a program in C to computey (0.6), correct up to 7 significant figures by the method of Runge
Kutta of second order from the following differential equation:

dy/dx=(0.5-x+y^2)/(x^2+y+1);y(0)=0**,**takingsteplengthh=0.1.

Assignment 24

Write a program in C to computey (0.5), correct up to 7 significant figures by the Modified
Euler's method and Runge-Kutta method of second order from the following differential equation:
dy/ dx=0.25y^2+x^2;y(0)=-1,

taking step length h=0.1.Hence,comparetheresults.

Assignment 25

Write a program in C to represent a set of 100 bivariate data of the form (x,y) into at wow ay
frequency table and then calculate$\bar{x}$ $\bar{y}$ and from the marginal distributions. Generate the
(x,y) tuples using random numbers so that 0≤x≤51and150≤y≤250.

Assignment 26

Write a program in C to compute the correlation co efficient between X and Y.

Assignment 28

Write a program in C to predict the value of x when the value of y is given and vice versa from a given bivariate data set.

Reference books:

1. Mollah S. A., "Numerical Analysis and Computational Procedures," Books and Allied (P) Ltd., Kolkata, 2017.

2. Sastry S.S., "Introductory Methods of Numerical Analysis," PHI, Private Ltd., New Delhi.

3. Pal N. & Sarkar S.,"Statistics: Concepts and Applications," PHI, New Delhi, 2005.

4. Das N.G., "Statistical Methods," Tata Mc Graw Hill Edu. P. Ltd., New Delhi, 2010.

Learning Outcome:

• The course will enable the students to

• Obtain an intuitive and working understanding of numerical methods for the basic problems of numerical analysis.

• Gain experience in the implementation of numerical methods using a computer.

• Trace error in these methods and need to analyse and predict it.

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SEMESTER VII

Subject Code	Paper Name	Credit
MNL05CPS	Computer Oriented Numerical Methods - LAB	1

UNIT-I

Introduction: Graphs and its applications, Finite and infinite graphs, incidence and degree, isolated Vertex, pendant Vertex, and Null graph, paths and circuits, isomorphism, sub graphs, walks, paths, and circuits, connected graphs, disconnected graphs and components, Connectivity checking algorithm, Euler graphs, Operations on graphs, more on Euler graphs, Hamiltonian paths and circuits, Travelling Salesman problem.

UNIT-II

Trees and Fundamental circuits: Trees and its properties, Distance and centres in a tree, Algorithm for checking if a graph is Tree, Partial k-trees, Dynamic Programming in partial trees, Spanning trees, Spanning trees in a Weighted graph, Prim's and Kruskal's algorithms Cutset and cut vertices: Properties of a cut set, Fundamental circuits and cut sets, connectivity and separability, Computing connected components, Menger's theorem, Network flows, 1-Isomorphism, 2-Isomorphism.

UNIT-III

Planar and Dual Graphs: Planar graph, Kuratowski's Graphs, Representations of a planar graph , Detection of planarity, Planar Separator Theorem, Geometric Dual, Combinatorial, Duel, Thickness and crossings, Algorithms for finding Clique and maximum clique.

UNITIV

Matrix Representation of Graphs: Incidence matrix, Adjacency matrix, Adjacency list, Circuits Matrix, Fundamental Circuit Matrix and Rank of B, Cut-set Matrix, Relationships among Af, Bf and Cf, path Matrix.

UNIT-V

Coloring, Covering and partitioning: Chromatic number, Chromatic partitioning, Chromatics polynomial, Coverings, Four colour problem, Algorithm for graph colouring. Directed Graphs: Digraphs and its types, Digraphs and binary Relations, Directed paths and connectedness, Euler Digraphs, Trees with Directed Edges, Fundamental Circuits in Digraphs, Matrices A,B and C of Digraphs, Adjacency Matrix of a Digraph, Paired Comparisons and Tournaments, Acyclic Digraphs

and De-cyclization.

Text Books:

1. Deo Narasingh, Graph Theory with Applications to engineering and Computer Science, Prentice Hall of India, 2001.

2. Raman Tulasi and Swamy M.N.S., Graph, Networks and Algorithms, John Wiley, 1981.

Reference Books:

1. West Douglas B., Introduction to Graph theory, Pearson Education, 2002.

2. Harary F., Graph Theory, Addison Wesley/ Narosa, 1998.

3. Rein gold E.M., Nievergelt J., Deo N., Combinatorial Algorithms: Theoryand Practice, R.

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