Curriculum for B. Sc. (Honours) in Computer Science



Learning Outcomes based Curriculum Framework (LOCF) 2021

Rajiv Gandhi University

(A Central University) RONO HILLS, DOIMUKH, ARUNACHAL PRADESH

2021

सयुक्त कुलसचिव (शैक्षणिक एवं सम्मेलन) राजीव गांधी विश्वविद्यालय Jt. Registrar (Acad. & Conf.) Rajiv Gandhi University Rono Hills, Doimukh (A.P.)

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Programme Objectives and Programme Learning

Outcomes

Programme Objectives:

The main objectives of the B.Sc. (Hons.) Computer Science Programme are to:

- 1) To develop an understanding and knowledge of the basic theory of Computer Science and Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation.
- 2) To develop the ability to use this knowledge to analyse new situations
- 3) To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit to the above-mentioned purpose.
- 4) The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems
- 5) To learn skills and tools like mathematics, statistics, physics and electronics to find the solution, interpret the results and make predictions for the future developments.

Programme Learning Outcomes:

After completing the programme the students will be able to:

- 1. Demonstrate the aptitude of Computer Programming and Computer based problem solving skills.
- 2. Display the knowledge of appropriate theory, practices and tools for the specification, design, implementation.
- 3. Display ethical code of conduct in usage of Internet and Cyber systems.
- 4. Ability to pursue higher studies of specialization and to take up technical employment.
- 5. Ability to formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate.
- 6. Ability to operate, manage, deploy, configure computer network, hardware, software operation of an organization.
- 7. Ability to appreciate emerging technologies and tools.
- 8. Apply standard Software Engineering practices and strategies in real -time software project development.
- 9. Design and develop computer programs/computer -based systems in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics.

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10. The ability to apply the knowledge and understanding to the analysis of a given information handling problem.

Semester	Core Courses (CC)	Elective Courses			Semester	
		DSE	GE	AEC	SEC	wise credits
I	CC 1, CC 2	-	GE 1	AEC 1	SEC 1	24
II	CC 3, CC 4	-	GE 2	AEC 2	SEC 2	24
	CC 5, CC 6, CC 7	-	GE 3	-	SEC 3	26
IV	CC 8, CC 9, CC 10	-	GE 4	-	SEC 4	26
V	CC 11, CC 12	DSE 1 DSE 2	-	-	-	24
VI	CC 13, CC 14	DSE 3 DSE 4	-	-	-	24
otal Minimum Credits	84	24	24	8	8	148

Curriculum Structure in B.Sc. (Hons.) Computer Science

Details of Courses to be taken by Students

Core Course (CC): Students have to take compulsory 14(Fourteen) Core Courses of 6 Credits each from of his/her own opted discipline.

Ability Enhancement Course (AEC): Students have to take compulsory 2(Two) Ability Enhancement Courses (AEC) of 4 Credits each.

Skill Enhancement Course (SEC): A student shall select at least 2 SEC of total 4 credits from his/her concerned discipline. For remaining 4 credits, he/she may select course(s) either from his/her own discipline or other under-graduate disciplines of Science and Technology in the College/University. The courses are divided into two groups: (i) Group-A: Contains courses to be offered in Semester-I and III. (ii) Group-B: Contains courses to be offered in Semester-II and IV. However, **options will be offered subject to availability of resource persons and infrastructure.**

Generic Electives (GE) (to be offered to students from other disciplines): Students are required to take 4(Four) Generic Elective (GE) courses/papers, either exclusively from one Discipline

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or Two papers each from two different Disciplines but both cases excluding his/her own discipline. The courses are divided into two groups: (i) Group-A: Contains courses to be offered in Semester-I and III. (ii) Group-B: Contains courses to be offered in Semester-II and IV. However, options will be offered subject to availability of resource persons and infrastructure.

Discipline Specific Elective (DSE): Students are required to take 4(Four) Discipline Specific Courses (DSE) of 6 Credits each; 2(Two) Courses in Semester-V and 2(Two) Courses in Semester-VI from his/her own discipline. Students shall opt for Dissertation/Project work in place of DSE-4 Papers (6 credits) in Semester-VI. **Options will be offered subject to availability of resource persons and infrastructure.**

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Semester and Course Wise Credit Distribution

Semester	Core Course (CC)	Ability Enhancement Course	Skill Enhancement Course (SEC)	Discipline Specific Elective	Elective Generic (GE)	Semester Wise Total Credit
	(14 Papers) Credit: 6	(AEC) (2 Papers) Credit: 4 each	(4 Papers) Credit: 2 each	(DSE) (4 Papers) Credit: 6 each	(4 Papers) Credit: 6 each	
I	CSC-CC-111: Programming Methodology CSC -CC-112: Computer System Architecture	AEC-1	SEC-1		GE-1	6+6+4+2+6 = 24
п	CSC -CC-121: Data Structure CSC -CC-122: Discrete Structures	AEC-2	SEC-2		GE-2	6+6+4+2+6 = 24
III	CSC -CC-231: Operating System CSC -CC-232: Algorithms CSC -CC-233: Computer Networks		SEC-3		GE-3	6+6+6+2+6 = 26
IV	CSC -CC-241: Software Engineering CSC -CC-242: Database Management System CSC -CC-243: Object Oriented Programming		SEC-4		GE-4	6+6+6+2+6 = 26
v	CSC -CC-351: Internet Technologies CSC -CC-352: Artificial Intelligence			DSE-1 DSE-2	-	6+6+6+6= 24
VI	CSC -CC-361: Computer Graphics CSC -CC-362: Machine Learning			DSE-3 DSE-4/ Dissertation		6+6+6+6= 24
Total Credits	6x14=84	4x2=8	2x4=8	6x4=24	6x4=24	148

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Discipline Specific Electives (DSE):

Semester-V: Choices for DSE-1 and DSE-2 (Choose any TWO)

CSC -DE-351: Compiler Design CSC -DE-352: Data Analytics CSC -DE-353: Computer Ethics CSC -DE-354: Image Processing CSC -DE-355: Internet of Things

Semester-VI:

(a) Choices for DSE-3 (Choose any ONE)

CSC -DE-361: Theory of Computation CSC -DE-362: Data Mining CSC -DE-363: Cloud Computing

(b) DSE – 4 (Compulsory)

CSC-DE-369: Dissertation

Skill Enhancement Course (SEC):

(Students have to choose different papers in different Semesters from the respective groups.)

Group-A: Choices for Semester-I and Semester-III

- 1. CSC -SE-001: Office Automation Tools
- 2. CSC -SE-003: ICT Hardware Techniques
- 3. CSC -SE-005: Python Programming

Group-B: Choices for Semester-II and Semester-IV

- 1. CSC -SE-002: Introduction to Web Technology
- 2. CSC -SE-004: Mobile Application Development
- 3. CSC -SE-006: Digital Marketing

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Generic Electives (GE) (to be offered to students of other Science and

Technology disciplines)

(Students have to choose two papers from each group for odd semesters and even semesters.)

Group-A: Choices for Semester-I and Semester-III

- 1. CSC -GE-001: Programming Methodology
- 2. CSC -GE-003: Discrete Structures
- 3. CSC -GE-005: Object Oriented Programming
- 4. CSC -GE-007: Algorithms

Group-B: Choices for Semester-II and Semester-IV

- 1. CSC-GE-002: Data Structure
- 2. CSC-GE-004: Operating System
- 3. CSC-GE-006: Computer Networks
- 4. CSC-GE-008: Database Management System

Ability Enhancement Course (AEC):

Semester I

(Students have to choose either of the language paper in first semester).

1. ENG-AE-111 COMMUNICATIVE ENGLISH 2. HIN-AE-111 **TO BET** (Hindi Sikshan)

Semester II

1. EVS-AE-121: ENVIRONMENTAL STUDIES

Assessment Methods, Conduct of Examinations, Eligibility Conditions, and Declaration of results

Academic performance in various courses i.e. core, discipline electives, generic electives and skill enhancement courses are to be considered as parameters for assessing the achievement of students. All students shall be subjected to the process of continuous evaluation and assessment. A number of appropriate assessment methods will be used to determine the extent to which students demonstrate desired learning outcomes.

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Marks allocation for Internal Assessment and End Semester Examinations, Question paper pattern, Duration of examination for various courses, Attendance and other eligibility conditions for appearing in the examination, and Declaration of results shall be done in accordance with the relevant provisions as stipulated in the above cited regulation and also the Ordinance(s) of the University.

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SEMESTER – I

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CSC-CC-111: PROGRAMMING METHODOLOGY

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- This course will make the students familiar with foundations of computing, programming and problemsolving using computers.
- To develop the ability to analyze a problem and devise an algorithm to solve it.
- To formulate algorithms, pseudocodes and flowcharts for arithmetic and logical problems
- To understand structured programming approach.
- To develop the basic concepts and terminology of programming in general.
- To implement algorithms in the 'C' language.
- To test, debug and execute programs.

Course Outcome

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

- Design algorithms and pseudocodes for problems.
- Solve different mathematical problems using conditional statements in C
- Know the basic principles of imperative and structural programming.
- Develop modular programs using control structures and arrays in 'C'.
- Handle the file processing using C programs.

Course Contents

UNIT – I

^cC' tokens, Character set, Keywords, Identifiers, Variables, Constants (character, integer, float, string, escape sequences, enumeration constant), Data Types (Built-in and user defined data types), Operators, Expressions, types of operators, Operator precedence and Order of evaluation, Character input and output. String input and output, Formatted input and output, Definition of Algorithms- Writing algorithms- top-down design –Program verification- The efficiency of algorithms- Concept of Recursion- some simple examples to illustrate these concepts like finding the GCD of two numbers- Swapping two variables etc.

UNIT – II

Input and Output in C-Formatted and Unformatted Functions -Library Functions, if statement, if...else statement, various forms of if, nested if, break statement, continue statement, go to statement, switch statement, nested switch statement, for statement, while statement, do while statement, arrays, working with string and standard functions.

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(10 LECTURES)

(12 Lectures)

(13 Lectures)

Introduction to pointers, pointer declaration, Arithmetic Operations with pointers, pointers and arrays, pointers and two-dimensional arrays, array of pointers, pointers to pointers, pointers and strings, void pointers, function definition and declaration, function proto types, types of functions, call by value and reference, functions returning more values, function as an argument, function with operators, function with arrays and pointers, recursion, pointer to function, storage classes.

UNIT – IV

Array, Types of Arrays – One, Two and Multidimensional array, Array Operations - declaration, initialization, accessing array elements, Memory representation of two-dimensional array (row major and column major), Passing arrays to function, Array applications - Finding maximum and minimum, Counting occurrences, Linear search, Sorting an array (Simple exchange sort, bubble sort), Merging two sorted arrays, Matrix operations (trace of matrix, addition, transpose, multiplication, symmetric, upper/ lower triangular matrix)

UNIT – V

Pre-processor directives, structures and unions, bit wise operators, files handling, command line arguments, dynamic memory allegation, graphics in C.

Reference Books

- 1. R.G. Dromey, *How to Solve it by Computer*, (12th Ed.), Pearson Education.
- 2. Maureen Sprankle, Problem Solving and Programming Concept, (7th Ed.) Pearson Publication (2006).
- 3. Schildt Herbert, C the Complete Reference, (4th Ed.) McGraw Hill
- 4. Behrouz A. Forouzan & Richard F. Gilberg, A Structured Programming Approach Using C, (3rd Ed.) Cengage (2007) Learning India
- 5. Brian Kernighan, & Dennis Ritchie, *The 'C' programming language*, (2nd Ed.) Pearson (2015).
- **6.** B. Gottfried, *Schaum's outline Series, Programming with C*, (3rd Ed.), Tata McGraw Hill (1996).
- 7. E. Balagurusamy, *Programming in ANSI C*, (7th Ed.) McGraw Hill.

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UNIT – III

(13 Lectures)

(12 Lectures)

CSC-CC-111: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments: Minimum 30 Experiments need to be completed covering all the Units.

1. Write a C program to display "This is my first C Program".

2. Write a C program to add two numbers (suppose 2 and 6 also by user input through keyboard) and display its sum.

3. Write a C program to multiply two numbers (4 and 5) and display its product.

4. Write a C program to calculate area and circumference of a circle.

5. Write a C program to perform addition, subtraction, division and multiplication of two numbers.

6. Write a program to calculate simple and compound interest.

7. Write a program to swap values of two variables with and without using third variable.

8. Write a program to display the size of every data type using "sizeof" operator.

9. Write a program to illustrate the use of unary prefix and postfix increment and

decrement operators.

10. Write a program to input two numbers and display the maximum number.

11. Write a program to find the largest of three numbers using ternary operators.

12. Write a program to find the roots of quadratic equation.

13. Write a program to input name, marks of 5 subjects of a student and display the name of

the student, the total marks scored, percentage scored and the class of result.

14. Write a Program to Check Whether a Number is Prime or not.

15. Write a program to find the largest and smallest among three entered numbers and

also display whether the identified largest/smallest number is even or odd.

16. Write a program to check whether the entered year is leap year or not (a year is

leap if it is divisible by 4 and divisible by 100 or 400.)

17. Write a program to find the factorial of a number.

18. Write a program to check number is Armstrong or not

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19. Write a program to count number of digits in a given integer.

20. Write a program to reverse a given integer.

21. Write a program to print number in reverse order with a difference of 2.

22. Write a program to print the sum of digits of a number using for loop.

23. Write a program to check whether a number is Palindrome or not.

24. Write a program to generate Fibonacci series.

25. If a four-digit number is input through the keyboard, write a program to obtain the sum of the first and last digit of this number.

26. Write a program to find GCD (greatest common divisor or HCF) and LCM (least common multiple) of two numbers.

27. Write a program to display the following pattern.

- *
- * *
- * * *
- * * * *

* * * * *

28. Write a Program to Search an element in array.

29. Write a Program to perform addition of all elements in Array.

30. Write a Program to find the largest and smallest element in Array

31. Write a Program to reverse the array elements in C Programming.

32. Write a Program for deletion of an element from the specified location from

Array.

33. Write a Program to access an element in 2-D Array.

34. Write a program for addition of two matrices of any order in C.

35. Write a Program to multiply two 3 X 3 Matrices.

36. Write a program to read a string and check for palindrome without using string

related function (a string is palindrome if its half is mirror by itself eg: abcdcba).

37. Write a program to accept a string and count the number of vowels present in this string.

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38. Write a program to generate Fibonacci series using recursive function.

39. Write a program to swap two integers using call by value and call by reference methods of passing arguments to a function.

40. Write a program to find sum of digits of the number using Recursive Function.

41. Write a program to read an integer number and print the reverse of that number using recursion.

42. Write a C program to find maximum and minimum between two numbers using functions.

43. Write a C program to check whether a number is even or odd using functions.

44. Write a C program to check whether a number is prime, Armstrong or perfect number using functions.

45. Write a C program to find power of any number using recursion.

Write a program to print day name using switch case.

46. Write a program to determine whether the input character is capital or small letter, digits or special symbol.

47. Write a program to check whether a date is valid or not.

48. Write a program to check whether a number is positive, negative or zero using switch case.

49. Write a program to create a structure named company which has name, address, phone and no. of employee as member variables. Read name of company, its address, phone and no Of Employee. Finally display these members" value.

50. Define a structure "complex" (typedef) to read two complex numbers and perform addition, subtraction of these two complex numbers and display the result.

51. Write a program to read RollNo, Name, Address, Age & average-marks of 12 students in the BCT class and display the details from function.

52. Write a program to add two distances in feet and inches using structure

53. Write a program to read and print an Employee"s Details using Structure.

54. C Program to list all files and sub-directories in a directory

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- 55. C Program to count number of lines in a file
- 56. C Program to print contents of file
- 57. C Program to copy contents of one file to another file
- 58. C Program to merge contents of two files into a third file
- 59. C program to delete a file

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CSC-CC-112: COMPUTER SYSTEM ARCHITECTURE

Credit: Theory: 06 Credits (90 Lectures)

Course Objectives

- To make students understand the basic structure, operation and characteristics of digital computer.
- To familiarize the students with arithmetic and logic unit as well as the concept of the pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To make students know the different ways of communicating with I/O devices and standard I/O interfaces.

Course Outcome

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

- Identify various components of computer and their interconnection
- Identify basic components and design of the CPU: the ALU and control unit.
- Understand the inner workings and performance capabilities of advanced microprocessors.
- Compare and select various Memory devices as per requirement and compare various types of IO mapping techniques
- An ability to anticipate hardware performance improvements based on established rules from past experiences with computer technology.
- Understand cache coherence issues.

Course Contents

UNIT-I

Computer types, Functional units, Basic operational concepts, Von-Neumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Data Types, Complements, Data representation, Fixed-Point Representation, Floating-Point Representation, Other Binary Codes, Error Detection Codes, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Flip-Flops, Sequential Circuits

UNIT-II

(22 Lectures)

(26 Lectures)

Registers, Register Transfer Language, Register Transfer, Bus & Memory Transfer, Arithmetic Microoperations, Logic Microoperations, Shift Microoperation, Counters, Multiplexer, Demultiplexer, Decoder, Encoder.

UNIT – III

(22 Lectures) Instruction codes, Computer Registers, Computer Instructions, Timing & Control, Instruction Cycles, Memory Reference Instruction, Input - Output & Interrupts, Complete Computer Description & Design of Basic Computer.

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UNIT – IV

(24 Lectures)

Hardwired vs. Micro programmed Control Unit, General Register Organization, Stack Organization, Instruction Format, Data Transfer & Manipulation, Program Control, RISC, CISC, Pipelining, Pipelined Datapath and control Handling Data hazards & Control hazards.

UNIT – V

(24 Lectures)

Peripheral Devices, I/O Interface, Data Transfer Schemes, Program Control, Interrupt, DMA Transfer, I/O Processor. Memory Hierarchy, Processor vs. Memory Speed, High-Speed Memories, Cache Memory, Associative Memory, Interleave, Virtual Memory, Memory Management. Instruction-level-parallelism Parallel processing challenges Flynn's classification, Hardware multithreading, Multicore processors

Reference Books

- 1. M. Morris Mano, *Computer System Architecture*, (3rd Ed), Prentice Hall (2009)
- David A. Patterson and John L. Hennessey, *Computer Organization and Design*, (5th Ed.), Morgan Kauffman/Elsevier (2014).
- 3. John L. Hennessy, David A. Patterson, *Computer Architecture: A Quantitative Approach*, (6th Ed.), Elsevier India (2018)
- 4. William Stallings, Computer Organization and Architecture, (10th Ed.) Pearson (2016).
- 5. John P. Hayes, Computer Architecture and Organization, (3rd Ed.), Tata McGraw-Hill (1998).
- 6. Andrew S. Tanenbaum, Structured Computer Organization, (5th Ed.), Pearson (2006).

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SEMESTER – II

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संयुक्त कुलसचिव (शैक्षणिक एवं सम्मेलन) राजीव गांधी विश्वविद्यालय J. Registrar (Acad. & Conf.) Rajiv Gandhi University Rono Hills, Doimukh (A.P.)

CSC-CC-121: DATA STUCTURE

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- To impart the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques
- To Understand basic concepts about stacks, queues, lists, trees and graphs
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.

Course Outcome

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

- To be familiar with fundamental data structures and with the manner in which these data structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles
- To have a knowledge of complexity of basic operations like insert, delete, search on these data structures.
- Ability to choose a data structure to suitably model any data used in computer applications.
- Design programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc.
- Ability to assess efficiency tradeoffs among different data structure implementations.
- Implement and know the applications of algorithms for sorting, pattern matching etc.

Course Contents

UNIT I. (11 Lectures)

UNIT – I

(11 Lectures)

Basic concepts-Algorithm Specification-Introduction, Recursive algorithms, Data Abstraction Performance analysis, Linear and Non Linear data structures, Singly Linked Lists-Operations, Concatenating, circularly linked lists-Operations for Circularly linked lists, Doubly Linked Lists-Operations. Representation of single, two dimensional arrays, sparse matrices-array and linked representations.

UNIT – II

(12 Lectures)

Stack-Operations, Array and Linked Implementations, Applications- Infix to Postfix Conversion, Postfix Expression Evaluation, Recursion Implementation, Queue-Definition and

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Operations, Array and Linked Implementations, Circular Queues - Insertion and Deletion Operations, Dequeue (Double Ended Queue).

UNIT – III

Trees, Representation of Trees, Binary tree, Properties of Binary Trees, Binary Tree Representations- Array and Linked Representations, Binary Tree Traversals, Threaded Binary Trees, Priority Queue- Implementation, Heap- Definition, Insertion, Deletion.

UNIT – IV

Graphs, Graph ADT, Graph Representations, Graph Traversals, Searching, Static Hashing-Introduction, Hash tables, Hash functions, Overflow Handling.

UNIT – V

Sorting Methods, Comparison of Sorting Methods, Search Trees- Binary Search Trees, AVL Trees-Definition and Examples, Red-Black and Splay Trees, Comparison of Search Trees, Pattern Matching Algorithm- The Knuth-Morris-Pratt Algorithm, Tries (examples).

Reference Books

- 1. Yashvant Kanitkar, Data Strucutre Through C++, BPB Publications (2003)
- 2. John Hubbard, *SCHAUM'S OUTLINE OF DATA STRUCTURES WITH C++*, (1st Edition), McGraw Hill Education, (2017)
- 3. Yedidyah Langsam, Moseh J. Augenstein, Aronn M. Tanenbaum, *Data Structures Using C* and C+(2nd Edition), PEARSON (2015)
- 4. Mark Allen Weiss, Data structures and Algorithm Analysis in C++, (3rd Edition), PEARSON, (2007)

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(12 Lectures)

(12 Lectures)

(13 Lectures)

CSC-CC-121: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Write program that uses functions to Search an element in an array.
- 2. Write program that uses functions to perform the multiplication and addition of two dimensional arrays
- 3. Write program that uses functions to perform the following:
 - **a.** Creation of list of elements where the size of the list, elements to be inserted and deleted are dynamically given as input.
 - **b.** Implement the operations, insertion, deletion at a given position in the list and search for an element in the list
 - **c.** To display the elements in forward / reverse order.
- 4. Write a program that demonstrates the application of stack operations (Eg: infix expression to postfix conversion)
- 5. Write aprogram to implement queue data structure and basic operations on it (Insertion, deletion, find length) and code atleast one application using queues.
- 6. Write a program that uses well defined functions to Create a binary tree of elements and Traverse the a Binary tree in preorder, inorder and postorder,
- 7. Write program that implements linear and binary search methods of searching for an elements in a list.
- 8. Write and trace programs to understand the various phases of sorting elements using the methods
 - a. Insertion Sort
 - b. Quicksort
 - **c.** Bubble sort
- 9. Write and trace programs to Create a Binary search tree and insert and delete from the tree.
- 10. Represent suitably a graph data structure and demonstrate operations of travesrals on it.

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CSC-CC-122 : DISCRETE STRUCTURES

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

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

- Demonstrate critical thinking, analytical reasoning, and problem solving skills
- Apply appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
- Identify a problem and analyze it in terms of its significant parts and the information needed to solve it
- Formulate and evaluate possible solutions to problems, and select and defend the chosen solutions
- Construct graphs and charts, interpret them, and draw appropriate conclusions

Course Outcome

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

- Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.
- Understand the basics of combinatorics, and be able to apply the methods from these subjects in problem solving.
- Be able to use effectively algebraic techniques to analyse basic discrete structures and algorithms.
- Understand asymptotic notation, its significance, and be able to use it to analyse asymptotic performance for some basic algorithmic examples.
- Understand some basic properties of graphs and related discrete structures, and be able to relate these to practical examples.

Course Contents

UNIT – I

(13 Lectures)

Sets: Finite and Infinite Sets, Uncountable Infinite Sets; Functions, Relations, Properties of Binary Relations, Closure, Partial Ordering Relations; Counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion.

UNIT – II

(11 Lectures)

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ajiv Gandhi Universi

Growth of Functions: Asymptotic Notations, Summation Formulas and Properties, Bounding Summations, Approximation by Integrals

UNIT – III

UNIT-IV

Recurrences: Recurrence Relations, Generating Functions, Linear Recurrence Relations with Constant Coefficients and their Solution, Substitution Method, Recurrence Trees, Master Theorem

Graph Theory: Basic Terminology, Models and Types, Multigraphs and Weighted Graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and Properties of Trees, Introduction to Spanning Trees

UNIT – IV

Propositional Logic: Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory

Reference Books

- C.L. Liu & Mahopatra, *Elements of Discrete mathematics*, (2nd Edition), Tata McGraw Hill(1985)
- 2. Kenneth Rosen, *Discrete Mathematics and Its Applications*, (7th Edition), McGraw Hill Education, 2006
- 3. M. O. Albertson and J. P. Hutchinson, *Discrete Mathematics with Algorithms*, John wiley Publication(1988)
- 4. V. K. Balakrishnan, Introductory Discrete Mathematics, Dover Publications Inc (2000)

जीव गांधी विश्वविद्यालय Registrar (Acad & Cont

(13 Lectures)

(11 Lectures)

(12 Lectures)

CSC-CC-122: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Write a program in C to create two sets and perform the Union operation on sets.
- 2. Write a program in C to create two sets and perform the Intersectison operation on sets.
- 3. Write a program in C to create two sets and perform the Difference operation on sets.
- 4. Write a program in C to create two sets and perform the Symmetric Difference operation.
- 5. Write a program in C to perform the Power Set operation on a set.
- 6. Write a program in C to Display the Boolean Truth Table for AND, OR, NOT.
- 7. Write a C Program to find Cartesian Product of two sets
- 8. Write a program in C for minimum cost spanning tree.
- 9. Write a program in C for finding shortest path in a Graph
- 10. Working of Computation software
- 11. Discover a closed formula for a given recursive sequence vice-versa
- 12. Recursion and Induction
- 13. Practice of various set operations
- 14. Counting 15. Combinatorial equivalence
- 15. Permutations and combinations
- 16. Difference between structures, permutations and sets
- 17. Implementation of a recursive counting technique
- 18. The Birthday problem
- 19. Poker Hands problem
- 20. Baseball best-of-5 series: Experimental probabilities
- 21. Baseball: Binomial Probability
- 22. Expected Value Problems
- 23. Basketball: One and One
- 24. Binary Relations: Influence

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SEMESTER – III

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संयुक्त कुलसचिव (रौक्षणिक एवं सम्मेलन) राजीव गांधी विश्वविद्यालय Jt. Registrar (Acad. & Conf.) Rajiv Gandhi University Rono Hills, Doimukh (A.P.)

CSC-CC-231: OPERATING SYSTEM

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.
- To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies

Course Outcome

- Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- To understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved over time.
- Understanding of design issues associated with operating systems.
- Understand various process management concepts including scheduling, synchronization, and deadlocks.
- To have a basic knowledge about multithreading.
- To understand concepts of memory management including virtual memory.
- To understand issues related to file system interface and implementation, disk management.
- To understand and identify potential threats to operating systems and the security features design to guard against them
- .To have sound knowledge of various types of operating systems Unix .
- Describe the functions of a contemporary operating system with respect to convenience, efficiency, and the ability to evolve.

Course Contents

UNIT – I

(11 Lectures)

(Introduction to Operating System) What is Operating System? History and Evolution of OS, Basic OS functions, Resource Abstraction, Types of Operating Systems– Multiprogramming Systems, Batch Systems, Time Sharing Systems; Operating Systems for Personal Computers, Workstations and Handheld Devices, Process Control & Real time Systems.

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(12 Lectures)

Process Hierarchy, Threads, Threading Issues, Thread Libraries; Process Scheduling, Non-Preemptive and Pre- emptive Scheduling Algorithms.

(13 Lectures)

Process Management (Deadlock) Deadlock, Deadlock Characterization, Necessary and Sufficient for Deadlock, Deadlock Handling Approaches: Deadlock Prevention, Deadlock Conditions Avoidance and Deadlock Detection and Recovery.

(Operating System Organization and Process Characterization) Processor and User Modes, Kernels, System Calls and System Programs, System View of the Process and Resources, Process Abstraction,

(Inter Process Communication and Synchronization) Concurrent and Dependent Processes, Critical Section, Semaphores, Methods for Inter-process Communication; Process Synchronization, Classical Process Synchronization Problems: Producer-Consumer, Reader-Writer.

UNIT-V

(Memory Management) Physical and Virtual Address Space; Memory Allocation Strategies-Fixed and -Variable Partitions, Paging, Segmentation, Virtual Memory.

References Books:

- 1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, (8th Ed), John Wiley Publications, (2008).
- 2. A.S. Tanenbaum, *Modern Operating Systems*, (3rd Ed), Pearson Education, (2007).
- 3. G. Nutt, Operating Systems, A Modern Perspective, (2nd Ed), Pearson Educatio, (1997).
- 4. W. Stallings, Operating Systems, Internals & Design Principles, (5th Ed), Prentice Hall of India.(2008)
- 5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill, (1992).

UNIT-IV



UNIT – II

UNIT - III

(12 Lectures)

(12 Lectures)

CSC-CC-231: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- Simulate the following CPU scheduling algorithms.
 a) FCFS b) SJF c) Round Robin d) Priority.
- 2. Write a C program to simulate producer-consumer problem using Semaphores
- 3. Write a C program to simulate the concept of Dining-philosophers problem.
- 4. Simulate MVT and MFT.
- 5. Write a C program to simulate the following contiguous memory allocation Techniques a) Worst fit b) Best fit c) First fit.
- 6. Simulate all page replacement algorithms a)FIFO b) LRU c) OPTIMAL
- 7. Simulate all File Organization Techniquesa) Single level directory b) Two level directory
- 8. Simulate all file allocation strategiesa) Sequential b) Indexed c) Linked.
- 9. Simulate Bankers Algorithm for Dead Lock Avoidance.
- 10. Simulate Bankers Algorithm for Dead Lock Prevention.
- 11. Write a C program to simulate disk scheduling algorithms.a) FCFS b) SCAN c) C-SCAN

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CSC-CC-232: ALGORITHMS

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- 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.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Course Outcome

- To learn good principles of algorithm design;
- To learn how to analyse algorithms and estimate their worst-case and average- case behaviour (in easy cases);
- To become familiar with fundamental data structures and with the manner in which these data structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles;
- To learn how to apply their theoretical knowledge in practice (via the practical component of the course).

Course Contents

UNIT – I

Introduction: Basic Design and Analysis Techniques of Algorithms, Correctness of Algorithm. Algorithm Design Techniques: Iterative Techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.

UNIT – II

(13 Lectures)

(10 Lectures)

Sorting and Searching Techniques: Elementary Sorting techniques– Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques- Heap Sort, Quick Sort, Sorting in Linear Time -Bucket Sort, Radix Sort and Count Sort, Searching Techniques- Medians & Order Statistics, complexity analysis

UNIT – III

Graphs Algorithms: Graph Algorithms– Breadth First Search, Depth First Search and its Applications, Minimum Spanning Trees. String Processing

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(13 Lectures)

UNIT – IV

Lower Bounding Techniques: Decision Trees, Balanced Trees, Red-Black Trees

UNIT – V

(12 Lectures)

Advanced Analysis Technique: Randomized Algorithm, Distributed Algorithm, Heuristics

Reference Books

- 1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, *Introduction to Algorithms*, (3rd Ed), PHI, (2009)
- Sara basse & A.V. Gelder, Computer Algorithm Introduction to Design and Analysis, (3rd Ed), Pearson, (1999)
- 3. Anany Levitin, *Introduction to the Design and Analysis of Algorithms*, (3rd Edition), Pearson Education (2017)
- 4. Jon Kleinberg, Eva Tardos, Algorithm Design, (1st Edition), PEARSON (2013)

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CSC-CC-232: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Write a test program to implement Divide and Conquer Strategy . Eg: Quick sort algorithm for sorting list of integers in ascending order
- 2. Write aprogram to implement Merge sort algorithm for sorting a list of integers in ascending order.
- 3. Write program to implement the DFS and BFS algorithm for a graph.
- 4. Write program to implement backtracking algorithm for solving problems like N- queens ...
- 5. Write a program to implement the backtracking algorithm for the sum of subsets problem
- 6. Write program to implement greedy algorithm for job sequencing with deadlines.
- 7. Write aprogram to implement Dijkstra's algorithm for the Single source shortest path problem.
- 8. Write aprogram that implements Prim's algorithm to generate minimum cost spanning tree.
- 9. Write a program that implements Kruskal's algorithm to generate minimum cost spanning tree
- 10. Write program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
- 11. Write program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.

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CSC-CC-233: COMPUTER NETWORKS

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- After successfully completing this course, students should be able to:
- Describe the general principles of data communication.
- Describe how computer networks are organized with the concept of layered approach.
- Describe how signals are used to transfer data between nodes.
- Implement a simple LAN with hubs, bridges and switches.
- Describe how packets in the Internet are delivered.
- Analyze the contents in a given data link layer packet, based on the layer concept.
- Design logical sub-address blocks with a given address block.
- Decide routing entries given a simple example of network topology
- Describe what classless addressing scheme is.
- Describe how routing protocols work.
- Use C programming language to implement network programs.
- Design and implement a network protocol.

Course Outcome

- Understand the structure of Data Communications System and its components. Be familiarize with different network terminologies.
- Familiarize with contemporary issues in network technologies.
- Know the layered model approach explained in OSI and TCP/IP network models
- Identify different types of network devices and their functions within a network.
- Learn basic routing mechanisms, IP addressing scheme and internetworking concepts.
- Familiarize with IP and TCP Internet protocols.
- To understand major concepts involved in design of WAN, LAN and wireless networks.
- Learn basics of network configuration and maintenance.
- Know the fundamentals of network security issues

Course Contents

UNIT – I

(12 Lectures)

Introduction to Computer Networks and Networking Elements: Network Definition, Network Topologies, Network Classifications, Network Protocol, Layered Network Architecture, Overview

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(12 Lectures)

(12 Lectures)

(12 Lectures)

(12 Lectures)

of OSI Reference Model, Overview of TCP/IP Protocol Suite, Hub, Switch (Managed and Unmanaged), Routers

UNIT – II

Data Communication Fundamentals and Techniques: Analog and Digital Signal, Data-Rate Limits, Digital to Digital Line Encoding Schemes, Pulse Code Modulation, Parallel and Serial Transmission, Digital to Analog Modulation - Multiplexing Techniques- FDM, TDM, Transmission Media.

UNIT – III

Networks Switching Techniques and Access Mechanisms: Circuit Switching, Packet Switching. Connectionless Datagram Switching, Connection- Oriented Virtual Circuit Switching; Dial-Up Modems, Digital Subscriber Line, Cable TV for Data Transfer.

UNIT – IV

Data Link Layer Functions and Protocol: Error Detection and Error Correction Techniques, Data-Link Control- Framing and Flow Control, Error Recovery Protocols-Stop and Wait ARQ, Go-Back-N ARQ, Point to Point Protocol on Internet.

UNIT – V

Multiple Access Protocol and Network Layer: CSMA/CD Protocols, Ethernet LANS; Connecting LAN and Back-Bone Networks- Repeaters, Hubs, Switches, Bridges, Router and Gateways, Networks Layer Functions and Protocols (6 Lectures) Routing, Routing Algorithms, Network Layer Protocol of Internet - IP Protocol, Internet Control Protocols.

Reference Books

- 1. B. A. Forouzan: *Data Communications and Networking*, (4th Ed), THM Publishing Company Ltd, (2007)
- 2. A. S. Tanenbaum, Computer Networks, (4th Ed), PHI Pvt. Ltd, (2002).
- 3. James F. Kurose, Keith W. Ross, *Computer Networking A Top-Down Approach*(6th Edition)Pearson Education(2017)
- 4. Ed Tittel, Schaum's Outline Of Computer Networking, McGraw Hill, (2020)

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CSC-CC-233: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments

- 1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
- 2. Study of Network Devices in Detail.
- 3. Study of network IP.
- 4. Connect the computers in Local Area Network.
- 5. Study of basic network command and Network configuration commands.
- 6. Performing an Initial Switch Configuration
- 7. Performing an Initial Router Configuration
- 8. Configuring and Troubleshooting a Switched Network
- 9. Connecting a Switch
- 10. Configuring WEP on a Wireless Router
- 11. Using the Cisco IOS Show Commands
- 12. Examining WAN Connections
- 13. Interpreting Ping and Traceroute Output
- 14. Demonstrating Distribution Layer Functions
- 15. Placing ACLs
- 16. Exploring Different LAN Switch Options
- 17. Implementing an IP Addressing Scheme
- 18. Examining Network Address Translation (NAT)
- 19. Observing Static and Dynamic Routing
- 20. Configuring Ethernet and Serial Interfaces
- 21. Configuring a Default Route
- 22. Configuring Static and Default Routes
- 23. Configuring RIP
- 24. Planning Network-based Firewalls
- 25. Configuring a Cisco Router as a DHCP Server

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SEMESTER - IV

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CSC-CC-241: SOFTWARE ENGINEERING

Credit: Theory: 04 Credits (60 Lecture), Practical: 02(60 Lectures)

Course Objectives

- To bring ability in solving software and system challenges with a comprehensive set of skills appropriate to the needs of the dynamic global computing-based society.
- To make capable of diverse team and organizational leadership in computing project settings.
- To enable for demonstrating ethical principles in the application of computing-based solutions to societal and organizational problems.
- To continually acquire skills and knowledge to support a professional pathway, including (but not limited to) communication, analytic, and technical skills.

Course Outcome

After completing the programme the students will be able to:

- Learn fundamental knowledge in mathematics, computer science, programming and computer systems
- Gather basic knowledge and understanding of the analysis, synthesis and design of complex systems
- Learn software engineering principles and techniques.
- Develop, maintain and evaluate large-scale software systems.
- Produce efficient, reliable, robust and cost-effective software solutions.
- Apply the principles, tools and practices of IT project management.
- Manage time, processes and resources effectively by prioritizing competing demands.
- Work as an effective member or leader of software engineering teams.
- Rapidly learn and apply emerging technologies.

Course Contents

UNIT – I

(8 Lectures)

(10 Lectures)

The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

UNIT – II

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UNIT – III

Estimation in Project Planning Process, Project Scheduling, Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan.

UNIT-IV

Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects.

UNIT-V

Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design, Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing and their type, Basis Path Testing.

Reference Books

- 1. R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGrawHill, 2009.
- 2. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.
- 3. K.K. Aggarwal and Y. Singh, Software Engineering (2nd Edition), New Age International Publishers, 2008.
- 4. I. Sommerville, *Software Engineering* (8th edition), Addison Wesley (2006).
- 5. D. Bell, Software Engineering for Students (4th Edition), Addison-Wesley (2005).
- 6. R. Mall, Fundamentals of Software Engineering (2nd Edition), Prentice-Hall of India (2004).

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(16 Lectures)

(8 Lectures)

(18 Lectures)

CSC-CC-241: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments

- 1. Problem Statement, Process Model
- 2. Requirement Analysis:
 - Creating a Data Flow
 - Data Dictionary, Use Cases
- 3. Project Management:
 - Computing FP
 - Effort
 - Schedule, Risk Table, Timeline chart
- 4. Design Engineering:
 - Architectural Design
 - Data Design, Component Level Design
- 5. Testing:
- Basis Path Testing
- 6. Water Jug Problem
- 7. Tik-Tac Toe problem

Sample Projects:

- 11. Criminal Record Management: Implement a criminal record management system for jailers, police officers and CBI officers
- 12. DTC Route Information: Online information about the bus routes and their frequency and fares
- 13. Car Pooling: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.
- 14. Patient Appointment and Prescription Management System
- 15. Organized Retail Shopping Management Software
- 16. Online Hotel Reservation Service System
- 17. Examination and Result computation system
- 18. Automatic Internal Assessment System
- 19. Parking Allocation System
- 20. Wholesale Management System

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CSC-CC-242: DATABASE MANAGEMENT SYSTEM

Credit: Theory: 04 Credits (60 Lecture), Practical: 02(60 Lectures)

Course Objectives

This course will help the students to

- Gain knowledge of database systems and database management systems software.
- Ability to model data in applications using conceptual modelling tools such as ER Diagrams and design data base schemas based on the model.
- Formulate, using SQL, solutions to a broad range of query and data update problems.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques.
- Compare, contrast and analyse the various emerging technologies for database systems such as NoSQL.
- Analyse strengths and weaknesses of the applications of database technologies to various subject areas.

Course Outcome

After completing the programme the students will be able to:

- Understand database concepts and structures and query language
- Understand the E R model and relational model
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
- Perform PL/SQL programming using concept of Cursor Management, Error Handling, Package and Triggers
- Execute various advance SQL queries related to Transaction Processing & Locking using concept of Concurrency control.
- Understand query processing and techniques involved in query optimization.
- Understand the principles of storage structure and recovery management.

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To apply the knowledge and understanding to the analysis of a given information handling problem.

Course Contents

UNIT-I

Introduction, Significance of Database, Database System Applications; Data Independence; Data Modeling for a Database; Entities and their Attributes, Entities, Attributes, Relationships and Relationships Types, Advantages and Disadvantages of Database Management System, DBMS Vs RDBMS.

UNIT – II

UNIT – III

Three Level Architecture of DBMS, The External Level or Subschema, The Conceptual Level or Conceptual Schema, The Internal Level or Physical Schema, Mapping; MySQL Architecture; SQL Server 2000 Architecture; Oracle Architecture; Database Management System Facilities, Data Definition Language, Data Manipulation Language; Client / Server Architecture

(20 Lectures)

(15 Lectures)

(11 Lectures)

Data Model and Types of Data Model, Relational Data Model, Hierarchical Model, Network Data Model, Object/Relational Model, Object-Oriented Model; Entity-Relationship Model, Modeling using E-R Diagrams, Notation used in E-R Model, Relationships and Relationship Types; Associative Database Model

UNIT – IV

An informal look at the relational model; Relational Database Management System; RDBMS Properties, The Entity-Relationship Model; Overview of Relational Query Optimization; System Catalog in a Relational DBMS, Information Stored in the System Catalog, How Catalogs are Stored

UNIT-V

Functional Dependency; Anomalies in a Database; Properties of Normalized Relations; First Normalization; Second Normal Form Relation; Third Normal Form; Boyce-Codd Normal Form (BNCF); Fourth and Fifth Normal Form; Basic Operations, Union, Difference, Intersection, Cartesian Product; Additional Relational Algebraic Operations, Projection, Selection, JOIN, Division



(6 Lectures)

(8 Lectures)

Reference Books

- 1. R. Elmasri, S.B. Navathe, *Fundamentals of Database Systems* (6th Edition), Pearson Education, 2010.
- 2. R. Ramakrishanan, J. Gehrke, *Database Management Systems* (3rd Edition), McGraw-Hill, 2002.
- 3. Silberschatz, H.F. Korth, S. Sudarshan, *Database System Concepts* 6th Edition, McGraw Hill, 2010.
- 4. R. Elmasri, S.B. Navathe *Database Systems Models, Languages, Design and application Programming*, 6th Edition, Pearson Education, 2013

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CSC-CC-242 (PRACTICAL)

Credit: Practical 02 Credits (60 Lectures)

- 1. Design a Database and create required tables. For e.g. Bank, College Database
- 2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
- 3. Write a sql statement for implementing ALTER, UPDATE and DELETE
- 4. Write the queries to implement the joins
- 5. Write the query for implementing the following functions: MAX(),MIN(),AVG(),COUNT()
- 6. Write the query to implement the concept of Intergrity constrains

EMPLOYEE Schema					
Field	Туре	NULL	KEY	DEFAULT	
Eno	Char(3)	NO	PRI	NIL	
Ename	Varchar(50)	NO		NIL	
JobType	Varchar(50)	NO		NIL	
Manager	Char(3)	YES	FK	NIL	
HireDate	Date	NO		NIL	
Dno	Integer	YES	FK	NIL	
Commission	Decimal(10,2)	YES		NIL	
Salary	Decimal(7,2)	NO		NIL	

- 7. Write the query to create the views
- 8. Perform the queries for triggers
- 9. Perform the following operation for demonstrating the insertion , updation and deletion
- 10. using the referential integrity constraints
- 11. Write the query for creating the users and their role

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Department Schema						
Field	Туре	NULL	KEY	DEFAULT		
Dno	Integer	NO	PRI	NULL		
Dname	Varchar(50)	YES		NULL		
Location	Varchar(50)	YES		New Delhi		

Query List

- 1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
- 2. Query to display unique Jobs from the Employee Table.
- 3. Query to display the Employee Name concatenated by a Job separated by a comma.
- 4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
- 5. Query to display the Employee Name and Salary of all the employees earning more than \$2850.
- 6. Query to display Employee Name and Department Number for the Employee No= 7900.
- 7. Query to display Employee Name and Salary for all employees whose salary is not in the range of \$1500 and \$2850.
- 8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
- 9. Query to display Name and Hire Date of every Employee who was hired in 1981.
- 10. Query to display Name and Job of all employees who don't have a current Manager.
- 11. Query to display the Name, Salary and Commission for all the employees who earn commission.
- 12. Sort the data in descending order of Salary and Commission.
- 13. Query to display Name of all the employees where the third letter of their name is _A`.
- 14. Query to display Name of all employees either have two _R's or have two _A's in their name and are either in Dept No = 30 or their Manger's Employee No = 7788.

- 15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
- 16. Query to display the Current Date.
- 17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
- 18. Query to display Name and calculate the number of months between today and the date each employee was hired.
- Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
- 20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with _J', 'A' and _M'.
- 21. Query to display Name, Hire Date and Day of the week on which the employee started.
- 22. Query to display Name, Department Name and Department No for all the employees.
- 23. Query to display Unique Listing of all Jobs that are in Department.
- 24. Query to display Name, Dept Name of all employees who have an _A' in their name.
- 25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.
- 26. Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees' Name who do not have a Manager.
- 27. Query to display Name, Dept No. and Salary of any employee whose department No. and salary matches both the department no. and the salary of any employee who earns a commission.
- 28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies \$100.
- 29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees
- 30. Query to display the number of employees performing the same Job type functions.
- 31. Query to display the no. of managers without listing their names.
- 32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
- 33. Query to display Name and Hire Date for all employees in the same dept. as Blake.

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- 34. Query to display the Employee No. And Name for all employees who earn more than the average salary.
- 35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a _T^c.
- 36. Query to display the names and salaries of all employees who report to King.
- **37.** Query to display the department no, name and job for all employees in the Sales department.

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CSC-CC-243: OBJECT ORIENTED PROGRAMMING

Credit: Theory: 06 Credits (60 Lectures), Practical: 02 Credits (60 Lectures)

Course Objectives

- To teach the students basic concepts of imperative and object-oriented programming, as realized in Java.
- To make students familiar with the basic language constructs will be discussed and also some simple guidelines for program design.
- To discuss about Java standard libraries and the classes within the library.
- The aim is to show how the library provides the ability to write programs, including:
 - 1. graphical user interfaces, manipulation of sounds and images, as an example of signal and image processing.
- To discuss how to do the retrieval of data from the web for further processing.
- To handle large data sets using existing classes with efficient data structures.
- The aim of the course is that students will learn to write, test and document simple Java programs.
- They will also develop their ability to understand, and thereby modify, debug and extend a given program.

Course Outcome

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

- Able to understand the use of OOPs concepts.
- Able to solve real world problems using OOP techniques.
- Able to understand the use of abstraction.
- Able to understand the use of Packages and Interface in java.
- Able to develop and understand exception handling, multithreaded applications with
- synchronization.
- Explain the relationship between a class and an object (class is a template from which many objects can be created; each of these is an instance of the class).
- To describe what an interface is and what is meant by a class implementing an interface.
- To explain the concept of subclass and describe how such a declaration works.
- To explain what is meant by a recursive function and be able to illustrate this with a simple example.
- To describe some standard algorithms, such as sorting and search, and know where they are given in the language's standard library.

Course Contents

UNIT – I

(10 Lectures)

Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue.

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UNIT-II

Single and Multidimensional Array, String class, String Buffer class, Operations on string,

Command line argument, Use of Wrapper Class.

UNIT - III

Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize () method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, finding objects (informal descriptions, domain analysis, etc.), finding classes, classification techniques, class roles, finding interactions, etc., Dynamic Model and functional Model; Phases of Object-oriented Development.

UNIT-IV

Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding Handle multilevel constructors - super keyword, Stop Inheritance - Final keywords, Creation and Implementation of an interface, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch, Understanding of Java Object Class, Comparison between Abstract Class and interface, Understanding of System.out.println statement.

UNIT – V

Use of Package, CLASSPATH, Import statement, Static import, Access control; Exception Handling:

Exception and Error, use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable

Class.

Reference Books

- 1. Herbert Schildt, Dale Skrien, Java Fundamentals A comprehensive introduction, (1st Ed.) McGraw Hill Education (2017).
- 2. E. Balaguruswamy, Programming with Java A Primer, (4th Ed.) McGraw Hill Education (2010)
- 3. Herbert Schild, The Complete Reference, Java 2 (4th Ed.), McGraw Hill Education (2017).
- 4. Horstmann & Cornell, Core Java Volume-I Fundamentals, (9th Ed.) Pearson Education (2013)

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(13 Lectures)

(11 Lectures)

(13 Lectures)

(13 Lectures)

CSC-CC-243: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments: Minimum 30 Experiments need to be completed covering all the Units.

- 1. Write a program to display any message
- 2. Write a Java program to display default value of all primitive data types of JAVA
- 3. Write a program check two strings are equal or not
- 4. Write a program to give the examples of operators.
- 5. Increment and decrement operators
 - i. Bitwise Complement Operator.
 - ii. Arithmetic operator.
 - iii. Relational Operator
 - iv. Bitwise operator.
 - v. Conditional Operator.
- 6. Write a program to give the example of control statements.
 - i. If statements.
 - ii. Switch Statements.
 - iii. For loop.
 - iv. While Statements.
 - v. Do statements
- 7. Write a program to calculate the following
 - a. Find the length of array.
 - b. Demonstrate a one-dimensional array.
 - c. Demonstrate a two-dimensional array.
 - d. Demonstrate a multi-dimensional array.
- 8. Write a program to give example for command line arguments.
 - I. To find the sum of command line arguments and count the invalid integers entered.
 - II. To get the name using command line
- 9. Write a program to print the following triangle of binary digits.

1

 $1 \ 0 \ 1$

- $1 \ 0 \ 0 \ 0 \ 1$
- $1\ 0\ 0\ 0\ 0\ 1$
- $1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1$
 - 10. Write a program to print the following triangle of binary digits.

051

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5

012345

11. Write a program to print the following triangle of binary digits.

1

12

123

1234

12345

- 12. Write a program to the find the following
 - **I.** Prime number checking
 - **II.** Sum of digit
- 13. Write a program to arrange the numbers in ascending order.
- 14. Write a program to calculate the roots of Quadratic equations.
- 15. Write a program for calculating Matrix Operations.
 - I. Addition.
 - **II.** Multiplication
- 16. Write a program to create a room class, the attributes of this class is room no, room type, room area and AC machine. In this class the member functions are set data and display data
- 17. Write a program create a class 'simple object'. Using constructor display the message.
- 18. Write a program for the following
 - **I.** Example for call by value.
 - **II.** Example for call by reference.
- 19. Write a program to give the example for 'this' operator. And also use the 'this' keyword as return statement.
- 20. Write a program to demonstrate static variables, methods, and blocks.
- 21. Write a program for reuse class. For this program use the above 'room class' program.
- 22. Create class named as 'a' and create a sub class 'b'. Which is extends from class 'a'. And use these classes in 'inherit' class.
- 23. Write a program to give the example for method overriding concepts.
- 24. Write a program to give the example for 'super' keyword.
- 25. Write a program to create a class named shape. In this class we have three
- 26. sub classes circle, triangle and square each class has two-member function named draw () and erase (). Create these using polymorphism concepts.
- 27. Write a program to give a simple example for abstract class.

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- 28. Write a program suppose, it is required to build a project consisting of a number of classes, possibly using a large number of programmers. It is necessary to make sure that every class from which all other classes in the project will be inherited. Since any new classes in the project must inherit from the base class, programmers are not free to create a different interface. Therefore, it can be guaranteed that all the classes in the project will respond to the same debugging commands.
- 29. Write a program to create interface A in this interface we have two method meth1 and meth2. Implements this interface in another class named MyClass.
- 30. Write a program to give example for multiple inheritance in Java.
- 31. Write a program to create interface named test. In this interface the member function is square. Implement this interface in arithmetic class.
- 32. Create one new class called ToTestInt in this class use the object of arithmetic class.
- 33. Create an outer class with a function display, again create another class inside the outer class named inner with a function called display and call the two functions in the main class.
- 34. Write a program to find the solution for the following problems using Recursion.
 - **I.** Find the maximum of an array. Let a[] be an array of integers. if n=1, a[0] is the only number in the array and so, maximum = a[0]. if n > 1, then do the following: find the maximum of n-1 entries of the array. Compare this maximum with the last entry a[n-1] and finalize.
 - **II.** Find the Fibonacci numbers are defined as F0=1, F1=1 and Fi=Fi-1+Fi-2 for $i \ge 2$.
- 35. Write a program to create automatic type conversions apply to overriding.
- 36. Create class box and box3d is extended class of box. The above two classes going to pull fill following requirement
 - I. Include constructor.
 - **II.** set value of length, breadth, height
 - **III.** Find out area and volume.

Note: Base class and sub classes have respective methods and instance variables.

- 37. Write a program using vector class.
- 38. Write a program for example of try and catch block. In this check whether the given array size is negative or not.
- 39. Write a program for example of multiple catch statements occurring in a program.
- 40. Write a program to illustrate sub class exception precedence over base class.
- 41. Write a program to illustrate usage of try/catch with finally clause.
- 42. Write a program to describe usage of throws clause.
- 43. Write a program for creation of user defined exception.
- 44. Write a program to rename the given file, after renaming the file delete the renamed file. (Accept the file name using command line arguments.)
- 45. Write a program to create a directory and check whether the directory is created.
- 46. Write a program to open one application using process class.

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SEMESTER – V

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CSC-CC-351: INTERNET TECHNOLOGIES

Credit: Theory: 06 Credits (60 Lectures), Practical: 02 Credits (60 Lectures)

Course Objectives

At the end of this course, each student should be able to:

- Gain knowledge of client side scripting, validation of forms and AJAX programming.
- Have understanding of server side scripting with PHP language.
- Have understanding of what is XML and how to parse and use XML Data with Java.
- Create applications by using the concepts like JSP and Servlet

Course Outcome

After completing the programme the students 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.
- Build interactive web applications using AJAX.

Course Contents

UNIT – I

(5 Lectures)

Understanding internet and its need, concept of intranet, difference between internet and intranet, a brief history, internet applications, Internet Service Providers (ISP) concept of client and server, concept of a web browser and web server, communicating on the internet, concept of domain- Physical domain, virtual domain, registering a domain, need of IP addressing, process to assign IP addresses, World Wide Web

UNIT – II

Overview of HTML, need of HTML, Use of it, concept of Tag, types of HTML tags, structure of HTML program Paragraph breaks, line breaks, background and BGcolor attributes, Heading styles, drawing lines, text styles, Text styles and other text effects-centering, spacing, controlling font size & color, List Using unordered, ordered, definition lists, Using Image tag, attributes of Image tag, changing width & height of image

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(15 Lectures)

(10 Lectures)

(20 Lectures)

(10 Lectures)

UNIT – III

Tables handling, To define header rows & data rows, use of table tag and its attributes. Use of caption tag, Concept of hyperlink, types of hyperlinks, linking to the beginning of document, linking to a particular location in a document, Images as hyperlinks, Introduction To frames, using frames & frameset tags, named frames how to fix the size of a frame, targeting named frames, Introducing CSS, font attributes, color and background attributes, text attributes, border attributes, margin related attributes, list attributes Using class and span tag, External Style Sheets

UNIT – IV

Introduction to JavaServer Pages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values, Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.

UNIT – V

JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects, Java Beans Fundamentals, JAR files, Introspection, Developing a simple Bean, Connecting to Database.

Reference Books

- 1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml, javascript, Perl Cgi, BPB Publications, 2009.
- 2. Cay Horstmann, BIG Java (3rd Edition), Wiley Publication, 2009
- 3. Herbert Schildt , Java 7, The Complete Reference (8th Edition), 2009.
- 4. Jim Keogh , The Complete Reference J2EE, TMH, 2002.
- 5. O'Reilly, Java Server Pages (3rd Edition), Hans Bergsten, 2003.

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CSC-CC-351 (PRACTICAL)

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments

- 1. Install the following on the local machine: Apache Web Server, Tomcat Application Server locally, Install MySQL and install PHP and configure it to work with Apache web server and MySQL.
- 2. Write an HTML page including any required JavaScript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.
- 3. Write a HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, words and lines in the text entered using an alert message. Words are separated with white spaces and lines are separated with new line character.
- 4. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
- 5. Create and save an XML document at the server, which contains 10 users information. Write a program which takes User Id as input and returns the user details by taking the user information from the XML document
- 6. Implement the following web applications using (a) PHP, (b) Servlets and (c) JSP.
 - i. A user validation web application, where the user submits the login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user.
 - ii. Modify the above program to use an XML file instead of database.
 - iii. Modify the above program using AJAX to show the result on the same page below the submit button.
 - iv. A simple calculator application that takes two numbers and an operator (+,-,*,/,%) from an HTML page and returns the result page with the operation performed on the operands.
 - v. A web application takes a name as input and on submit it shows a hellopage where is taken from the request. It shows the start time at the right top corner of the page and provides the logout button. On clicking this button, it should show a logout page with Thank You message with the duration of usage. (Use session to store name and time).

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- vi. A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello, you are not authorized to visit this site" message, where should be replaced with the entered name. Otherwise it should send "Welcome to this site" message.
- vii. A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello, you are not authorized to visit this site" message, where should be replaced with the entered name. Otherwise it should send "Welcome to this site" message.
- viii. A web application for implementation: The user is first served a login page which takes user's name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions. If name and password matches serves a welcome page with user's full name.

If name and password doesn't match, then serves "password mismatch" page. If name is not found in the database, serves a registration page, where user's full name is asked and on submitting the full name, it stores, the login name, password and full name in the database (hint: use session for storing data, submitted login name and password).

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CSC-CC-352: ARTIFICIAL INTELLIGENCE

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- To Explain what constitutes "Artificial" Intelligence and how to identify systems with Artificial • Intelligence.
- To Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- To Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc.).
- To Implement basic AI algorithms (e.g., standard search or constraint propagation algorithms).
- To Design and perform an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports.
- To Explain the limitations of current Artificial Intelligence techniques. •

Course Outcome

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

- Do the advanced Data Analysis.
- Solve the Industry relevant problems and grow in career. •
- Create AI solutions for various business problems.
- Build and deploy production grade AI/ML applications.
- Apply AI methods, techniques and tools immediately

Course Contents

UNIT-I

Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, their structure, behaviour and environment.

UNIT – II

Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.

UNIT – III

Ontologies, Foundations of Knowledge Representation and Reasoning, Representing and Reasoning about Objects, Relations, Events, Actions, Time, and Space; Predicate Logic, Situation Calculus, Description Logics, Reasoning with Defaults, Reasoning about Knowledge, Sample Applications, Probability, Connection to Logic, Independence, Bayes Rule, Bayesian Networks, Probabilistic Inference, and Sample Applications,

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(15 Lectures)

(10 Lectures)

(15 Lectures)

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UNIT-IV

Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames, and Scripts, Production Rules, Conceptual Graphs. Programming in Logic (PROLOG) Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic, Inference, Possible World Representations.

UNIT – V

(8 Lectures)

Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition Nets.

Reference Books

- 1. DAN.W. Patterson, Introduction to A.I and Expert Systems, PHI (2007).
- Russell &Norvig, Artificial Intelligence-A Modern Approach, (2nd Ed.) LPE, Pearson Prentice Hall, (2005).
- 3. Rich & Knight, Artificial Intelligence, (2nd Ed.), Tata McGraw Hill, (1991).
- 4. W.F. Clocksin and Mellish, *Programming in PROLOG*, (3rd Ed.), Narosa Publishing House, (2001).
- 5. Ivan Bratko, *Prolog Programming for Artificial Intelligence*, (3rd Ed.), Addison-Wesley, Pearson Education, (2000).

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(12 Lectures)

CSC-CC-352: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments: Minimum 20 Experiments need to be completed covering all the Units.

- 1. Write a prolog program to calculate the sum of two numbers.
- 2. Write a prolog program to find the maximum of two numbers.
- 3. Write a prolog program to calculate the factorial of a given number.
- 4. Write a prolog program to calculate the nth Fibonacci number.
- 5. Write a prolog program, insert nth (item, n, into list, result) that asserts that result is the list into list with item inserted as the nth element into every list at all levels.
- 6. Write a Prolog program to remove the Nth item from a list.
- 7. Write a Prolog program, remove nth (Before, After) that asserts the After list is the Before list with the removal of every nth item from every list at all levels.
- 8. Write a Prolog program to implement append for two lists.
- 9. Write a Prolog program to implement palindrome (List)
- 10. Write a Prolog program to implement max(X,Y,Max) so that Max is the greater of two numbers X and Y.
- 11. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List.
- 12. Write a Prolog program to implement sumlist(List,Sum) so that Sum is the sum of a given list of numbers List.
- 13. Write a Prolog program to implement two predicates even length (List) and odd length (List) so that they are true if their argument is a list of even or odd length respectively.
- 14. Write a Prolog program to implement reverse (List, ReversedList) that reverses lists.
- 15. Write a Prolog program to implement maxlist(List, Max) so that Max is the greatest number in the list of numbers List using cut predicate.
- 16. Write a Prolog program to implement GCD of two numbers.
- 17. Write a prolog program that implements Semantic Networks/Frame Structures.
- 18. Write a program to implement breadth first search algorithm.
- 19. Write a program to simulate 4-Queen / N-Queen problem.
- 20. Write a program to solve tower of Hanoi problem.
- 21. Write a program to implement alpha beta search.
- 22. Write a program for Hill climbing problem.
- 23. Write a program to implement A* algorithm.
- 24. Write a program to implement AO* algorithm.
- 25. Write a program to solve water jug problem.
- 26. Design the simulation of tic tac toe game using min-max algorithm.
- 27. Write a program to solve Missionaries and Cannibals problem.
- 28. Design an application to simulate number puzzle problem.
- 29. Write a program to shuffle Deck of cards.
- 30. Solve traveling salesman problem using artificial intelligence technique.
- 31. Solve the block of World problem.
- 32. Solve constraint satisfaction problem
- 33. Write a program to derive the predicate.

(for e.g.: Sachin is batsman, batsman is cricketer) -> Sachin is Cricketer.

34. Write a program which contains three predicates: male, female, parent. Make rules for following family relations: father, mother, grandfather, grandmother, brother, sister, uncle, aunt, nephew and niece, cousin.Ouestion:

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- I. Draw Family Tree
- II. Define: Clauses, Facts, Predicates and Rules with conjunction and disjunction

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SEMESTER - VI

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CSC-CC-361: COMPUTER GRAPHICS

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- The goal of this course is to provide an introduction to the theory and practice of computer graphics. •
- The course will assume a good background in programming in C, C++ and in other programming languages and a background in mathematics including familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication.
- Students will use the standards-based OpenGL library in several programming projects illustrating the theory and practice of programming computer graphics applications.

Course Outcome

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

- To understand the various computer graphics hardware and display technologies.
- 2D and 3D viewing technologies
- Various 2D and 3D objects transformation techniques.

Course Contents

UNIT-I

Nature and types of computer graphics, manual drafting vs computer graphics, functions and characteristics of computer graphics, Applications of computer graphics. Graphic Mathematics: cubic splines, bezier curves, regression analysis, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table;

UNIT – II

Brief Review of input and output hardware's. Computer output modes, display coordinate system, aspect ratio, aliasing and anti-aliasing, limitation of raster scan, effects on prints and plots, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm

UNIT - III

Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm. Graphics environment, programming considerations: object and image, scaling, location, proportion, plotting, image plotting, sizing, sorting. 2D transformation, translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems;

UNIT-IV

(13 Lectures)

(12 Lectures)

(10 Lectures)

(13 Lectures)

Viewing pipeline, Window to viewport Co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse, 3D viewing, Curve representation, surfaces, designs, Bezier curves, B-spline curves,

3D transformations, translation, rotation, scaling & other transformations, Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping,

UNIT – V

(12 Lectures)

Review of typical interactive multimedia systems; Aspects of multimedia systems; Multimedia design techniques, Multimedia technology; Network-based multimedia systems.

Reference Books

- 1. N Krishnamurthy, Introduction to Computer Graphics, Tata McGraw Hill (2001)
- 2. Zhigang Xiang, Roy A., Schaum's Outline of Computer Graphics (2nd Ed.) (2000)
- 3. Francis Hill Jr., Stephen Kelley, Computer Graphics Using OpenGL (3rd Ed.) (2007)
- 4. Hearn & Baker, Computer Graphics (2nd Ed.). Prentice Hall India(2002).
- 5. Zhigang X. & Plastock R.a., *Theory and problems of Computer Graphics* (Schaum's Outline), Tata Mc Graw Hill.
- 6. Rafael C. Gonza Lez and Richard E. Woods, *Digital Image Processing*, Pearson Education(2018).
- 7. Jain V.K., Fundamentals of Digital Image processing, (1st Ed) Pearson Education (2015).

कुलसचिव (शैक्षणिक एवं

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CSC-CC-361: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments: Minimum 10 Experiments need to be completed covering all the Units.

- 1. To study the various graphics commands in C language.
- 2. Develop the DDA Line drawing algorithm using C language
- 3. Develop the Bresenham's Line drawing algorithm using C language
- 4. Develop the Bresenham's Circle drawing algorithm using C language
- 5. Develop the C program for to display different types of lines
- 6. Perform the following 2D Transformation operation Translation, Rotation and Scaling
- 7. Perform the Line Clipping Algorithm
- 8. Perform the Polygone clipping algorithm
- 9. Perform the following tasks using MATLAB commands.
- 10. Read the grayscale and color image.
- 11. Display images on the computer monitor
- 12. Write images in your destination folder.
- 13. Generate the complement image using MATLAB.

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CSC-CC-362: MACHINE LEARNING

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- To introduce the basic concepts and techniques of Machine Learning
- Differentiate between supervised, unsupervised machine learning approaches
- Ability to choose appropriate machine learning algorithm for solving a problem
- Design and adapt existing machine learning algorithms to suit applications
- Understand the underlying mathematical relationships across various machine learning algorithms
- Design and implement machine learning algorithms to real world applications
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcome

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

- Understand and master the concepts and principles of Machine Learning, Artificial Intelligence.
- Learn about major applications of Machine Learning across various use cases in various industry verticals.
- Understand the concept machine learning and its types
- Learn about fast-changing world of Information Technology needs.
- The graduates will be able to function in multiple disciplinary teams.

Course Contents

UNIT – I

Concept of Machine Learning, Applications of Machine Learning, Key elements of Machine Learning, Supervised vs. Unsupervised Learning, Statistical Learning: Bayesian Method, The Naive Bayes Classifier

UNIT – V

(12 Lectures)

(13 Lectures)

(10 Lectures)

Software's for Machine Learning and Linear Algebra Overview, Plotting of Data, Vectorization, Matrices and Vectors, Addition, Multiplication, Transpose and Inverse using Available Tool such as MATLAB, Bayesian networks- conditional independence Markov random fields- inference in graphical models- Belief propagation-Markov models- Hidden Markov models- decoding states from observations- learning HMM parameters.

UNIT – III

Linear Regression: Prediction using Linear Regression, Gradient Descent, Linear Regression with one Variable, Linear Regression with Multiple Variables, Polynomial Regression, Feature Scaling/Selection, Partitioned based Clustering, K-means- K-medoids; Hierarchical Clustering - Agglomerative- Divisive-Distance measures; Density based Clustering -DBScan; Spectral clustering.

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(13 Lectures)

Logistic Regression: Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one Variable and with Multiple Variables, large margin classification- Kernel methods- Support Vector Machines. Classification and Regression Trees, Classification Methods-Nearest neighbour- Decision trees- Linear Discriminant Analysis

UNIT – V

Regularization, Regularization and its Utility: The problem of Overfitting, Application of Regularization in Linear and Logistic Regression, Regularization and Bias/Variance. Introduction, Model Representation, Gradient Descent vs. Perceptron Training, Stochastic Gradient Descent, Multilayer Perceptrons, Multiclass Representation, Backpropagation Algorithm.

Reference Books

- 1. Andreas C. MŸller Andreas MŸller, *Introduction to Machine Learning with Python*, (1st Ed.), Shroff/O'Reilly; (2016)
- 2. Tom M. Mitchell, *Machine Learning*, McGraw-Hill International Editions (1997)
- 3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras and Tensor Flow: Concepts, Tools and Techniques to Build Intelligent System, (2nd Ed.), Shroff/O'Reilly,(2019)
- 4. Andreas C. Mueller and Sarah Guido, *Introduction to Machine Learning with Python: A Guide for Data Scientists*, (1st Ed.) O'Reilly, (2016)
- 5. Peter Flach, *Machine Learning: The Art and Science of Algorithms that Make Sense of Data*, (1st Ed.) Cambridge University Press, (2012)

2021

(12 Lectures)

CSC-CC-362: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments: Minimum 10 Experiments need to be completed.

- 1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
- 2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
- 3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
- 4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
- 5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
- 6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
- 7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
- 8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
- 9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

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

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DISCIPLINE SPECIFIC ELECTIVES

Q 051 7/2021

CSC-DE-351: COMPILER DESIGN

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- Understand the major phases of compilation and to understand the knowledge of Lex tool & YAAC tool.
- Develop the parsers and experiment the knowledge of different parsers design without automated tools.
- Construct the intermediate code representations and generation
- Convert source code for a novel language into machine code for a novel computer
- Apply for various optimization techniques for dataflow analysis

Course Outcome

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

- Specify and analyze the lexical, syntactic and semantic structures of advanced language features
- Separate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation
- Write a scanner, parser, and semantic analyzer without the aid of automatic generators
- Turn fully processed source code for a novel language into machine code for a novel computer
- Describe techniques for intermediate code and machine code optimization
- Design the structures and support required for compiling advanced language features.

Course Contents

UNIT – I

Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, tool-based approach to compiler construction.

UNIT –II

Lexical analysis: interface with input, parser and symbol table, token, lexeme and patterns. Difficulties in lexical analysis.Error reporting.Implementation. Regular definition, Transition diagrams, LEX.

UNIT – V

Syntax analysis: CFGs, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC., Syntax directed definitions: inherited and

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(12 Lectures)

(15 Lectures)

(10 Lectures)

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synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.

UNIT – IV

Type checking: type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions, Run time system: storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.

UNIT – V

Intermediate code generation: intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls. Implementation issues, Code generation and instruction selection: issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, code generation from dags, peep hole optimization, code generator generators, specifications of machine.

Reference Books

- 1. V. Aho, R. Sethi, and J. D. Ullman, *Compilers: Principles, Techniques and Tools*, (2nd Ed), PEARSON Education, (2007)
- 2. C. Fischer and R. LeBlanc, Crafting a Compiler in C, PEARSON Education, (1991)
- 3. Allen I. Holub, Compiler Design in C, PHI,(1990)
- 4. Andrew W. Appel and Maia Ginsburg, *Modern Compiler Implementation in C*, Cambridge Press, (2004)

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(12 Lectures)

(11 Lectures)
CSC-DE-351: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Lex program to check if characters other than alphabets occur in a string.
- 2. Lex program to count words that are less than 10 and greater than 5.
- 3. Lex Program to check whether a number is Prime or Not
- 4. Lex program to check valid Mobile Number
- 5. Lex program to check if a Date is valid or not
- 6. Lex program to check whether input number is odd or even
- 7. LEX program to count the number of vowels and consonants in a given string
- 8. Lex program to check whether the input is digit or not
- 9. Lex Program to check valid email
- 10. Lex Program to count number of words
- 11. Write a Program to compute the FOLLOW of NT's
- 12. Write a Program to compute the FIRST of NT's
- 13. Write a Program to generate a Parse tree
- 14. Write a program to implement Lexical analyzer
- 15. Write a program to whether expression is valid or not
- 16. Write a Program to remove the left recursion from a given grammar
- 17. Write a Program to check whether a string belongs to a given grammar or not
- 18. Create a Lexer to take input from text file and count no of characters, no. of lines & no.

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CSC-DE-352: DATA ANALYTICS

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- Develop in depth understanding of the key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics
- Apply principles of Data Science to the analysis of business problem
- Demonstrate knowledge of statistical data analysis techniques utilized in business decision making.
- To understand the applications using Map Reduce Concepts.
- To implement mathematical aggregation operators and Statistical operations.
- To explore the fundamental concepts of big data analytics.
- To learn the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.

Course Outcome

- Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
- Understand the concepts of Hadoop Distributed file system and hadoop file system interfaces.
- Illustrate the concepts of PIG and HIVE K2
- Identify the characteristics of datasets and compare the trivial data and big data for various applications.
- Demonstration the various methodologies of descriptive statistics
- Understanding of modeling uncertainty and statistical inference
- Understanding of analytical frameworks
- Apply analytical and critical thinking to identify, formulate, analyze, and solve complex problems in order to reach authenticated conclusions

Course Contents

UNIT – I

(10 Lectures)

Data Definitions and Analysis Techniques: Elements, Variables, and Data Categorization, Levels of Measurement, Data Management and Indexing

UNIT – V

(12 Lectures)

Descriptive Statistics: Measures of Central Tendency, Measures of Location of Dispersions, Error Estimation and Presentation (Standard Deviation, Variance), Introduction to Probability

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UNIT - III

Data Analysis Techniques-I: Regression Analysis, Classification Techniques, Clustering Techniques (K-Means, K-Nearest Neighbourhood) UNIT

UNIT-IV

Data Analysis Techniques-II: Association Rules Analysis, Decision Tree, Introduction to R Programming: Introduction to R Software Tool, Statistical Computations using R (Mean, Standard Deviation, Variance, Regression, Correlation etc.)

UNIT-V

Practice and Analysis with R and Python Programming, Sensitivity Analysis. Basic Analysis Techniques: Statistical Hypothesis Generation and Testing, Chi-Square Test, T-Test, Analysis of Variance, Correlation Analysis, Maximum Likelihood Test

Reference Books

- 1. Ronald E Walppole, Raymond H Myres, Sharon L. Myres and Leying Ye, Probability and statistics for Engineers and Scientists, (9th Ed.), Prentice Hall Inc.,(2006)
- 2. Travor Hastie Robert Tibshirani Jerome Friedman, The Elements of Statistical Learning, Data Mining, Inference, and Prediction, (2nd Ed.), Springer, (2014).
- 3. John M. Chambers, Software for Data Analysis: Programming with R (Statistics and Computing), Springer, (2008)

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(14 Lectures)

(12 Lectures)

(12 Lectures)

CSC-DE-352: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Write a R program to get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND) using in R.
- 2. Write a R program to perform data import/export (.CSV, .XLS, .TXT) operations using data frames in R.
- 3. Write a R program to get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept in R.
- 4. Write a R program to perform statistical operations (Mean, Median, Mode and Standard deviation) using R.
- 5. Write a R program to perform data pre-processing operations
 - i) Handling Missing data
 - **ii**) MinMax normalization
- 6. Write a R program to perform dimensionality reduction operation using PCA for Houses Data Set
- 7. Write a R program to perform Simple Linear Regression with R.
- 8. Write a R program to perform K-Means clustering operation and visualize for iris data set
- 9. Write R script to diagnose any disease using KNN classification and plot the results.
- 10. Write R script to perform market basket analysis using Association Rules (Apriori).
- 11. Write a Python program to perform K-Means clustering operation K-means Clustering
- 12. Write a Python program to implement Linear Regression technique
- 13. Write a Python program to implement Logistic Regression
- 14. Write a Python program to implement Simulate Singular Value Decomposition
- 15. Run a basic word count Map Reduce program to understand Map Reduce Paradigm.
- 16. Implement matrix multiplication with Hadoop Map Reduce
- 17. Write a Map Reduce program that mines weather data. Hint: Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.
- 18. Run the Pig Latin Scripts to find a max temp for each and every year.
- 19. Run the Pig Latin Scripts to find Word Count.
- 20. Write Pig Latin scripts sort, group, join, project, and filter your data.

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CSC-DE-353: COMPUTER ETHICS

Credit: Theory: 06 Credits (90 Lectures)

Course Objectives

- Recognize milestones in computing, networking, and information storage and retrieval
- Be familiar with the language and content of ethical discourse
- Understand modern debates surrounding intellectual property
- Appreciate the threats to privacy posed by modern information gathering techniques
- Be familiar with a range of other ethical issues raised by modern information technology and relevant to computer professionals

Course Outcome

- The student will be able to describe and distinguish between the various ethical theories which can be used to form the basis of solutions to moral dilemmas in computing.
- Identify traditional and current Issues related to Computers, Information Systems, Ethics, Society and Human Values;
- The student will be able to identify and define the components of a structured plan for solving ethical problems and, in the process, will be able to understand the basis for her/his own ethical system.
- Given several examples of professional codes of ethics related to computing, the student will be able to compare and contrast these examples, discussing their commonalties, differences, and implications.
- Develop skills of critical analysis and applying ethical principles to situations and dialectical thinking

Course Contents

UNIT – I

(16 Lectures)

(24 Lectures)

The Need for Computer Ethics Training and Historical Milestones, Unwrapping the Gift, Privacy and Personal Information, Intellectual Property.

UNIT – II

Defining the Field of Computer Ethics, Computer ethics codes, Sample Topics in Computer Ethics, Computer crime and computer security, Software theft and intellectual property rights, Computer hacking and the creation of viruses, Computer and information system failure, Invasion of privacy. Privacy in the Workplace and on the Internet, Social implications of artificial intelligence and expert systems, The information technology salesman issues

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UNIT - III

Transparency and Virtual Ethics, Freedom of Speech in Cyberspace, Democracy, Information Access, Computer Crime Errors, Failures, and Risks, Professiona Ethics and Responsibilities

UNIT-IV

Developing the Ethical Analysis Skills and Professional Values, Privacy, Accountability, Government Surveillance

UNIT-IV

Boundaries of Trust, Trust Management, Wikipedia, Virtual Trust, Plagiarism in Online Environment, Intellectual Property, Net neutrality

Reference Books:

- 1. Deborah G.Johnson, Helen Nissenbaum, Computing, Ethics & Social Values, Prentice Hall, (1995).
- 2. Richard A. Spinello, Herman T. Tavani, Readings in Cyberethics, Jones and Bartlett Publishers, (2001).
- 3. Simon Rogerson, Terrell Ward Bynum, Computer Ethics and Professional Responsibility, Blackwell, (2004)

कुलसचिव (शैक्षणिक

ाजीव गांधी विश्व

(15 Lectures)

(18 Lectures)

(17 Lectures)

CSC-DE-354: IMAGE PROCESSING

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- To study the image fundamentals and mathematical transforms necessary for image • processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.

Course Outcome

- Review the fundamental concepts of a digital image processing system. •
- Analyze images in the frequency domain using various transforms. •
- Evaluate the techniques for image enhancement and image restoration. •
- Categorize various compression techniques.
- Interpret Image compression standards. •
- Interpret image segmentation and representation techniques. •

Course Contents

UNIT-I

Digital Image Fundamentals: Elements of Visual Perception, Light, Brightness Adaption and Discrimination, Image Sensing and Acquisition, Image Sampling and Quantization, Pixels, Some Basic Relationships between Pixels, Coordinate Conventions, Imaging Geometry, Perspective Projection, Linear and Nonlinear Operations

UNIT – II

Image Enhancement in the Spatial Domain: Intensity transformations, Contrast Stretching, Histogram Equalization, Correlation and Convolution, Basics of Spatial Filtering, Smoothing Filters, Sharpening Filters, Gradient and Laplacian.

UNIT - III

(10 Lectures)

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(12 Lectures)

(10 Lectures)

Filtering in the Frequency domain: Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2 -D sampling, Discrete Cosine Transform, Frequency domain filtering.

UNIT-IV

Image Restoration and Reconstruction: Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.

UNIT – V

Color Image Processing, Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation. Morphological Image Processing, Dilation and Erosion, Opening and Closing., Extensions to Gray -Scale Images, Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds.

Reference Books:

- 1. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson Hall, (1988)
- 2. Stan Birchfield, Image Processing and Analysis, (1st Ed), Cengage Learning, (2017)
- 3. Wilhelm Burger, Mark J. Burge, *Principles of Digital Image Processing*, Springer(2013)
- 4. Rafael C. Gonza Lez, Richard E. Woods, *Digital Image Processing*, (4th Ed.), Pearson (2018)

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(16 Lectures)

(12 Lectures)

CSC-DE-354: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. MATLAB program to extract different Attributes of an Image.
- 2. MATLAB program for Image Negation.
- 3. MATLAB program for Power Law Transformation.
- 4. MATLAB program for Histogram Mapping and Equalization.
- 5. MATLAB program for Image Smoothening and Sharpening.
- 6. MATLAB program for Edge Detection using Sobel, Prewitt and Roberts Operators.
- 7. MATLAB program for Morphological Operations on Binary Images.
- 8. MATLAB program for Pseudo Coloring.
- 9. MATLAB program for Chain Coding.
- 10. MATLAB program for DCT/IDCT Computation.
- 11. To create a program to display grayscale image using read and write operation.
- 12. To create a vision program to find histogram value and display histograph of a grayscale and color image.
- 13. To create a vision program for NonLinear Filtering technique using edge detection
- 14. To create a vision program to determine the edge detection of an image using different operators.
- 15. To create a program to discretize an image using Fourier transformation.
- 16. To create a program to eliminate the high frequency components of an image.
- 17. To create a color image and perform read and write operation.
- 18. To obtain the R, B, G colour values and resolved colour values from a colour box by choosing any colour.
- 19. To create a program performs discrete wavelet transform on image.
- 20. Simulation and Display of an Image, Negative of an Image(Binary & Gray Scale)
- 21. Implementation of Relationships between Pixels
- 22. Implementation of Transformations of an Image
- 23. Contrast stretching of a low contrast image, Histogram, and Histogram Equalization

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- 24. Display of bit planes of an Image
- 25. Display of FFT(1-D & 2-D) of an image
- 26. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image
- 27. Implementation of Image Smoothening Filters(Mean and Median filtering of an Image)
- 28. Implementation of image sharpening filters and Edge Detection using Gradient Filters
- 29. Image Compression by DCT, DPCM, HUFFMAN coding
- 30. Implementation of image restoring techniques
- 31. Implementation of Image Intensity slicing technique for image enhancement
- 32. Canny edge detection Algorithm

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CSC-DE-355: Internet of Things

Credit: Theory: 04 Credits (60 Lecture), Practical: 02(60 Lectures)

Course Objectives

This course will help the students to

- Understand the definition and significance of the Internet of Things
- Discuss the architecture, operation, and business benefits of an IoT solution
- Examine the potential business opportunities that IoT can uncover
- Explore the relationship between IoT, cloud computing, and big data
- Identify how IoT differs from traditional data collection systems.
- Design & develop IOT Devices.
- Cloud based applications of IoT

Course Outcome

After completing the programme the students will be able to

- Learn the concepts of Sensors, Wireless Network and Internet
- Learn and implement use of Devices in IoT technology.
- Learn the different IoT Technologies like Micro-controller, Wireless communication like Bluetooth, GPRS, Wi-Fi and Storage and embedded systems
- Understand how to program on embedded and mobile platforms including different Microcontrollers like ESP8266, Raspberry Pi, Arduino and Android programming
- Understand how to make sensor data available on the Internet (data acquisition) and understand how to analyze and visualize sensor data
- Understand, analysis and evaluate different protocols used in IoT.
- Learn basic python programming for IoT applications
- Learn and design different applications in IoT.
- Design, develop and test different prototypes in IoT

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Course Contents UNIT I. (12 Lectures) UNIT – I

(12 Lectures)

(Introduction to IoT, Sensors and Actuators) Introduction to IoT: Definition, Characteristics, Applications, Evolution, Enablers, Connectivity Layers, Addressing, Networking and Connectivity Issues, Network Configurations, Multi-Homing, Sensing: Sensors and Transducers, Classification, Different Types of Sensors, Errors, Actuation: Basics, Actuator Types- Electrical, Mechanical Soft Actuators

UNIT – II

(12 Lectures)

(Introduction to Networking, Communication Protocols and Machine-to-Machine Communication) Basics of Networking, Communication Protocols, Sensor Network, Machine to Machine Communication (IoT Components, Inter-Dependencies, SoA, Gateways, Comparison Between IoT & Web, Difference Protocols, Complexity of Networks, Wireless Networks, Scalability, Protocol Classification, MQTT & SMQTT, IEEE 802.15.4, Zigbee)

UNIT – III

(16 Lectures)

(Arduino Programming) Interoperability in IoT, Introduction To Arduino Programming, Integration Of Sensors And Actuators With Arduino

(Python Programming and Raspberry Pi) Introduction to Python Programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi, Implementation of IoT with Raspberry Pi

UNIT – IV

(10 Lectures)

(Data Analytics and Cloud Computing) Data Handling and Analytics, Cloud Computing Fundamentals, Cloud Computing Service Model, Cloud Computing Service Management and Security, Sensor-Cloud Architecture, View and Dataflow

UNIT – V

(10 Lectures)

(FOG Computing and Case Studies) FOG Computing: Introduction, Architecture, Need, Applications and Challenges. Industrial IoT, Case Studies: Agriculture, Healthcare, Activity Monitoring.

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Reference books

- 1. Pethuru Raj and Anupama C. Raman, *The Internet of Things: Enabling Technologies, Platforms, and Use Cases*", CRC Press.
- 2. A. Bahga and Vijay Madisetti , *Internet of Things: A Hands-on Approach*, Universities Press
- 3. Adrian McEwen, Designing the Internet of Things, Wiley Publishers, 2013,
- 4. Daniel Kellmereit, The Silent Intelligence: The Internet of Things. 2013,

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CSC-DE-355 (PRACTICAL)

Credit: Practical 02 Credits (60 Lectures)

List of Experiments

- 1. Study of AT89S52 Ultra Development Kit with Development Tool/Environment of Kiel Software for Microcontroller programming.
- 2. To familiarize with Intel Galileo Gen2 board and understand the procedure of creation and compilation of C source code.
- 3. Wifi module interfacing with Intel Galileo Gen2 Board.
- 4. To study of IoT Data Logging using Beaglebone Black and Thingspeak.
- 5. Turn your smartphone into an IoT device using the IBM Watson IoT Platform cloudhosted service.
- 6. Start Raspberry Pi and try various Linix commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
- 7. Run some python programs on Pi like:
 - a. Read your name and print Hello message with name
 - b. Read two numbers and print their sum, difference, product and division.
 - c. Word and character count of a given string.
 - d. Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input
- 8. Run some python programs on Pi like:
 - a. Print a name 'n' times, where name and n are read from standard input, using for and while loops.
 - b. Handle Divided by Zero Exception.
 - c. Print current time for 10 times with an interval of 10 seconds.
- 9. Read a file line by line and print the word count of each line.
- 10. LED bilking using Raspberry pi on Proteus using Flowchart.
- 11. LED bilking without push button using Raspberry pi on Proteus using Flowchart.
- 12. Design a Flowchart Temperature and Humidity sensor and display the result using UART on terminal.
- 13. Design a Flowchart Weather Station with Arduino.
- 14. Design a Flowchart Wi-Fi based Air Quality Monitoring System.
- 15. Design a Flowchart of interfacing 80 cm Infrared Proximity Sensor. To measure distance using Ultrasonic Sensor.
- 16. Design a system using Arduino where you can monitor Temperature and Humidity of a place on an IDE/LCD.
- 17. Design a system using Arduino where you can monitor Soil Moisture of a plant on an

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IDE. If soil moisture is less, then LED should glow.

- 18. Design a system using Arduino that blinks an LED when you detect a motion in an area on an IDE.
- 19. Motion detection and blinking the light when the light intensity is low using Arduino.
- 20. Flash an LED at a given on time and off time cycle, where the two times are taken from a file

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CSC-DE-361 : THEORY OF COMPUTATION

Credit: Theory: 06 Credits (90 Lectures)

Course Objectives

This course will help the students to

- 1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages
- 2. To illustrate finite state machines to solve problems in computing
- 3. To explain the hierarchy of problems arising in the computer sciences.
- 4. To familiarize Regular grammars, context frees grammar.

Course Outcome

After completing the programme the students will be able to:

- To use basic concepts of formal languages of finite automata techniques
- Design Finite Automata's for different Regular Expressions and Languages
- Construct context free grammar for various languages
- Solve various problems of applying normal form techniques, push down automata and Turing Machines

Course Contents

UNIT – I

(18 Lectures)

Finite Automata (Fa): Introduction, Deterministic Finite Automata (DFA) -Formal definition, simpler notations (state transition diagram, transition table), language of a DFA. Nondeterministic Finite Automata (NFA)- Definition of NFA, language of an NFA, Equivalence of Deterministic and Nondeterministic Finite Automata, Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Minimization of Deterministic Finite Automata, Finite automata with output (Moore and Mealy machines) and Inter conversion.

UNIT – II

(18 Lectures)

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Regular Expressions (RE): Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions, REGULAR GRAMMARS: Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA. Proving languages to be non-regular -Pumping lemma, applications, Closure properties of regular languages.

UNIT – III

Context Free Grammar (CFG): Derivation Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings. Ambiguity in CFG's, Minimization of CFG's, CNF, GNF, Pumping Lemma for CFL's, Enumeration of Properties of CFL (Proof's omitted).

UNIT-IV

Pushdown Automata: Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA. TURING MACHINES (TM): Formal definition and behaviour, Languages of a TM, TM as accepters.

UNIT V (22 Lectures)

UNIT-V

Properties of recursive and recursively enumerable languages, Universal Turing machine, The Halting problem, Undecidable problems about TMs. Context sensitive language and linear bounded automata (LBA), Chomsky hierarchy, Decidability, Post's correspondence problem (PCP), undecidability of PCP.

Reference books

- 1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory Languages and Computation (3rd edition), Pearson Education, India, 2007
- 2. K. L. P Mishra, N. Chandrashekaran Theory of Computer Science-Automata Languages and Computation(2nd edition), Prentice Hall of India, India, 2003.

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(18 Lectures)

(18 Lectures)

(18 Lectures)

CSC-DE-362: DATA MINING

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- This course will make the students familiar with foundations of computing, programming and problemsolving using computers.
- To develop the ability to analyze a problem and devise an algorithm to solve it.
- To formulate algorithms, pseudocodes and flowcharts for arithmetic and logical problems
- To understand structured programming approach.
- To develop the basic concepts and terminology of programming in general.
- To implement algorithms in the 'C' language.
- To test, debug and execute programs.

Course Outcome

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

- Design algorithms and pseudocodes for problems.
- Solve different mathematical problems using conditional statements in C
- Know the basic principles of imperative and structural programming.
- Develop modular programs using control structures and arrays in 'C'.
- Handle the file processing using C programs.

Course Contents

UNIT – I

Introduction: Basic Data Mining Tasks, Data Mining Issues, Data Mining Metrics, Data Mining from a Database Perspective.

UNIT – V

Data Mining Techniques: A Statistical Perspective on Data Mining, Similarity Measures. Decision Trees, Neural Networks, Genetic Algorithms.

UNIT – V

Classification: Distance-Based Algorithms, Decision Tree-Based Algorithms.

UNIT – IV

Clustering: Similarity and Distance Measures, Partitional Techniques, Hierarchical Techniques, Density based Techniques, Clustering Large Databases, Clustering with Categorical Attributes.

UNIT – V

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(12 Lectures)

(10 Lectures)

(12 Lectures)

(13 Lectures)

(13 Lectures)

Association Rules: Basic Algorithms, Parallel and Distributed Algorithms, Incremental Rules, Advanced Association Rule Techniques. Advanced Techniques: Web Mining, Spatial Mining, Temporal Mining, Text Mining, and Applications of Data mining.

Reference Books

- 1. Jiawei Han and Micheline Kamber, 'Data Mining: Concepts and Techniques, Morgan Kaufmann, India
- 2. A K Pujari, 'Data Mining Techniques, University Press, India
- 3. Han, Manilla and Smyth, 'Principles of Data Mining', PHI, India
- 4. Pang-ning Tan, Michael Steinbach, Vipin Kumar, Introduction To Data Mining, Pearson, 1st Edition, 2007.

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CSC-DE-362: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments: Minimum 10 Experiments need to be completed covering all the Units.

- 1. Demonstration of preprocessing on dataset student.arff
- 2. Demonstration of preprocessing on dataset labor.arff
- 3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm
- 4. Demonstration of Association rule process on dataset test.arff using apriori algorithm
- 5. Demonstration of classification rule process on dataset student.arff using j48 Algorithm
- 6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm
- 7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm
- 8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm
- 9. Demonstration of clustering rule process on dataset iris.arff using simple k-means
- 10. Demonstration of clustering rule process on dataset student.arff using simple k-means
- 11. Create a Weather Table with the help of Data Mining Tool WEKA
- 12. Create an Employee Table with the help of Data Mining Tool WEKA
- 13. Write a program of Naive Bayesian classification using C
- 14. Write a program of cluster analysis using simple k-means algorithm using any programming language.
- 15. To implement classification using Bayes theorm.
- 16. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets

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CSC-DE-363: Cloud Computing

Credit: Theory: 04 Credits (60 Lecture), Practical: 02(60 Lectures)

Course Objectives

This course will help the students to

- Provide with the fundamentals and essentials of Cloud Computing.
- Provide a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- Enable exploring some important cloud computing driven commercial systems and applications.
- Expose themselves to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

Course Outcome

After completing the programme the students will be able to

- Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.
- Compare the advantages and disadvantages of various cloud computing platforms.
- Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine.
- Program data intensive parallel applications in the cloud.
- Analyze the performance, scalability, and availability of the underlying cloud technologies and software.
- Identify security and privacy issues in cloud computing.
- Explain recent research results in cloud computing and identify their pros and cons.
- Solve a real-world problem using cloud computing through group collaboration

Course Contents

UNIT – I

(06 Lectures)

Definition, characteristics, components, Cloud service provider, the role of networks in Cloud computing, Cloud deployment models- private, public & hybrid, Cloud service models,

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multitenancy, Cloud economics and benefits, Cloud computing platforms - IaaS: Amazon EC2, PaaS: Google App Engine, Microsoft Azure, SaaS.

UNIT – II

Virtualization concepts, Server virtualization, Storage virtualization, Storage services, Network virtualization, Service virtualization, Virtualization management, Virtualization technologies and architectures, virtual machine, Measurement and profiling of virtualized applications. Hypervisors: KVM, Xen, VMware hypervisors and their features.

UNIT – III

Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. MapReduce and extensions: Parallel computing, the map-Reduce model, Parallel efficiency of MapReduce, Relational operations using Map-Reduce, Enterprise batch processing using MapReduce.

UNIT-IV

Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud. Cloud computing security architecture: General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro - architectures; Identity Management and Access control, Autonomic security, Security challenges : Virtualization security management - virtual threats, VM Security Recommendations, VM - Specific Security techniques, Secure Execution Environments and Communications in cloud.

UNIT-V

(18 Lectures)

Implementing real time application over cloud platform, Issues in Inter-cloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment. Cloud Middleware. Mobile Cloud Computing. Inter Cloud issues. A grid of clouds, Sky computing, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud

Reference books

- 1. Gautam Shroff, Enterprise Cloud Computing, Cambridge publication
- 2. Ronald Krutz and Russell Dean Vines, Cloud Security, Wiley-India
- 3. Dr. Kumar Saurabh, Cloud Computing, Wiley Publication

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(08 Lectures)

(18 Lectures)

(10 Lectures)

CSC-DE-363: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
- 2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
- 3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
- 4. Use GAE launcher to launch the web applications.
- 5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
- 6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
- 7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
- 8. Install Hadoop single node cluster and run simple applications like wordcount.

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GENERIC ELECTIVES

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CSC-GE-001: PROGRAMMING METHODOLOGY

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- The course aims to provide exposure to problem-solving through programming.
- It aims to train the student to the basic concepts of the C-programming language.
- This course involves a lab component which is designed to give the student hands-on experience with the concepts.

Course Outcome

- Learn to develop simple algorithms and flow charts to solve a problem.
- Develop problem solving skills coupled with top down design principles.
- Learn about the strategies of writing efficient and well-structured computer algorithms/programs.
- Develop the skills for formulating iterative solutions to a problem.
- Learn array processing algorithms coupled with iterative methods.
- Learn text and string processing efficient algorithms.
- Learn searching techniques and use of pointers.
- Understand recursive techniques in programming.

Course Contents

UNIT – I

Introduction to Programming, Program Concept, Characteristics of Programming, Stages in Program Development, Algorithms, Notations, Design, Flowcharts, Types of Programming Methodologies, Introduction to C++ Programming - Basic Program Structure In C++, Variables and Assignments, Input and Output, Selection and Repetition Statements.

UNIT – II

Top-Down Design, Predefined Functions, Programmer -defined Function, Local Variable, Function Overloading, Functions with Default Arguments, Call -By-Value and Call-By-Reference Parameters, Recursion.

UNIT – III

Introduction to Arrays, Declaration and Referring Arrays, Arrays in Memory, Initializing Arrays. Arrays in Functions, Multi-Dimensional Arrays.

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(13 Lectures)

(12 Lectures)

(11 Lectures)

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UNIT – IV

(12 Lectures)

Structures - Member Accessing, Pointers to Structures, Structures and Functions, Arrays of Structures, Unions.

UNIT – V

(12 Lectures)

Declaration and Initialization, Reading and Writing Strings, Arrays of Strings, String and Function, Strings and Structure, Standard String Library Functions.

Reference Books:

- 1. J. R. Hanly and E. B. Koffman, Problem Solving and Program Design in C, Pearson, 2015.
- 2. N. Dale and C. Weems, *Programming and problem solving with C++*, brief edition, Jones & Bartlett Learning, 2010.

2021

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CSC-GE-001: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Write Programs to learn the use different operators
 - **a.** To learn elementary techniques involving arithmetic operators and mathematical expressions, appropriate use of selection (if, switch, conditional operators) and control structures
 - **b.** Learn how to use functions and parameter passing in functions, writing recursive programs.
- 2. Write Programs to learn the use of strings and string handling operations.
 - a. Problems which can effectively demonstrate use of Arrays. Structures and Union.
 - **b.** Write programs using pointers.
 - c. Write programs to use files for data input and output.
 - d. Write programs to implement search algorithms.
- 3. Write a C program to display "This is my first C Program".
- 4. Write a C program to add two numbers (suppose 2 and 6 also by user input through keyboard) and display its sum.
- 5. Write a C program to multiply two numbers (4 and 5) and display its product.
- 6. Write a C program to calculate area and circumference of a circle.
- 7. Write a C program to perform addition, subtraction, division and multiplication of two numbers.
- 8. Write a program to calculate simple and compound interest.
- 9. Write a program to swap values of two variables with and without using third

variable.

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CSC-GE-002: DATA STUCTURE

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- To impart the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques
- To Understand basic concepts about stacks, queues, lists, trees and graphs
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.

Course Outcome

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

- To be familiar with fundamental data structures and with the manner in which these data structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles
- To have a knowledge of complexity of basic operations like insert, delete, search on these data structures.
- Ability to choose a data structure to suitably model any data used in computer applications.
- Design programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc.
- Ability to assess efficiency tradeoffs among different data structure implementations.
- Implement and know the applications of algorithms for sorting, pattern matching etc.

Course Contents

UNIT – I

(11 Lectures)

Basic concepts- Algorithm Specification-Introduction, Recursive algorithms, Data Abstraction Performance analysis, Linear and Non Linear data structures, Singly Linked Lists-Operations, Concatenating, circularly linked lists-Operations for Circularly linked lists, Doubly Linked Lists-Operations. Representation of single, two dimensional arrays, sparse matrices-array and linked representations.

UNIT –II

(12 Lectures)

Stack-Operations, Array and Linked Implementations, Applications- Infix to Postfix Conversion, Postfix Expression Evaluation, Recursion Implementation, Queue- Definition and Operations,

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Array and Linked Implementations, Circular Queues - Insertion and Deletion Operations, Dequeue (Double Ended Queue).

UNIT – III

Trees, Representation of Trees, Binary tree, Properties of Binary Trees, Binary Tree Representations-Array Linked Representations, Binary Tree Traversals, Threaded and Binary Trees, Priority Queue- Implementation, Heap- Definition, Insertion, Deletion.

UNIT – IV

Graphs, Graph ADT, Graph Representations, Graph Traversals, Searching, Static Hashing-Introduction, Hash tables, Hash functions, Overflow Handling.

UNIT – V

Sorting Methods, Comparison of Sorting Methods, Search Trees- Binary Search Trees, AVL Trees-Definition and Examples.

Red-Black and Splay Trees, Comparison of Search Trees, Pattern Matching Algorithm- The Knuth-Morris-Pratt Algorithm, Tries (examples).

Reference Books

- 1. Fundamentals of Data structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson-Freed, Universities Press.
- 2. Data structures and Algorithm Analysis in C, 2nd edition, M. A. Weiss, Pearson.
- 3. Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill

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(12 Lectures)

(13 Lectures)

(12 Lectures)

CSC-GE-002: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Write program that uses functions to perform the following:
 - **a.** Creation of list of elements where the size of the list, elements to be inserted and deleted are dynamically given as input.
 - **b.** Implement the operations, insertion, deletion at a given position in the list and search for an element in the list
 - **c.** To display the elements in forward / reverse order.
- 2. Write a program that demonstrates the application of stack operations (Eg: infix expression to postfix conversion)
- 3. Write aprogram to implement queue data structure and basic operations on it (Insertion, deletion, find length) and code atleast one application using queues.
- 4. Write a program that uses well defined functions to Create a binary tree of elements and Traverse the a Binary tree in preorder, inorder and postorder,
- 5. Write program that implements linear and binary search methods of searching for an elements in a list.
- 6. Write and trace programs to understand the various phases of sorting elements using the methods
 - **a.** Insertion Sort
 - **b.** Quicksort
 - **c.** Bubble sort
- 7. Write and trace programs to Create a Binary search tree and insert and delete from the tree.
- 8. Represent suitably a graph data structure and demonstrate operations of travesrals on it.

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CSC-GE-003: DISCRETE STRUCTURES

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

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

- Demonstrate critical thinking, analytical reasoning, and problem solving skills
- Apply appropriate mathematical and statistical concepts and operations to interpret data and to solve
- problems
- Identify a problem and analyze it in terms of its significant parts and the information needed to solve it
- Formulate and evaluate possible solutions to problems, and select and defend the chosen solutions
- Construct graphs and charts, interpret them, and draw appropriate conclusions

Course Outcome

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

- Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.
- Understand the basics of combinatory, and be able to apply the methods from these subjects in problem solving.
- Be able to use effectively algebraic techniques to analyses basic discrete structures and algorithms.
- Understand asymptotic notation, its significance, and be able to use it to analyses asymptotic performance for some basic algorithmic examples.
- Understand some basic properties of graphs and related discrete structures, and be able to relate these to practical examples.

Course Contents

UNIT – I

(13 Lectures)

Sets: Finite and Infinite Sets, Uncountable Infinite Sets; Functions, Relations, Properties of Binary Relations, Closure, Partial Ordering Relations; Counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion.

UNIT – II

(11 Lectures)

Growth of Functions: Asymptotic Notations, Summation Formulas and Properties, Bounding Summations, Approximation by Integrals

Recurrences: Recurrence Relations, Generating Functions, Linear Recurrence Relations with Constant Coefficients and their Solution, Substitution Method, Recurrence Trees, Master Theorem

Graph Theory: Basic Terminology, Models and Types, Multigraphs and Weighted Graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and Properties of Trees, Introduction to Spanning Trees

Propositional Logic: Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory

1. C.L. Liu & Mahopatra, Elements of Discrete mathematics, 2nd Sub Edition 1985, Tata McGraw Hill

- 2. Rosen, Discrete Mathematics and Its Applications, Sixth Edition 2006
- 3. T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, Prentice Hall on India (3rd edition 2009)
- 4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms 1988 John wiley Publication

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UNIT-IV

UNIT – V

Reference Books

UNIT – III

(12 Lectures)

(11 Lectures)

(13 Lectures)

CSC-GE-003: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Write a program in C to create two sets and perform the Union operation on sets.
- 2. Write a program in C to create two sets and perform the Intersectison operation on sets.
- 3. Write a program in C to create two sets and perform the Difference operation on sets.
- 4. Write a program in C to create two sets and perform the Symmetric Difference operation.
- 5. Write a program in C to perform the Power Set operation on a set.
- 6. Write a program in C to Display the Boolean Truth Table for AND, OR, NOT.
- 7. Write a C Program to find Cartesian Product of two sets
- 8. Write a program in C for minimum cost spanning tree.
- 9. Write a program in C for finding shortest path in a Graph
- 10. Working of Computation software
- 11. Discover a closed formula for a given recursive sequence vice-versa
- 12. Recursion and Induction
- 13. Practice of various set operations
- 14. Counting
- 15. Combinatorial equivalence
- 16. Permutations and combinations
- 17. Difference between structures, permutations and sets
- 18. Implementation of a recursive counting technique
- 19. The Birthday problem
- 20. Poker Hands problem
- 21. Baseball best-of-5 series: Experimental probabilities
- 22. Baseball: Binomial Probability
- 23. Expected Value Problems
- 24. Basketball: One and One
- 25. Binary Relations: Influence

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CSC-GE-004: OPERATING SYSTEM

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.
- To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies

Course Outcome

- Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- To understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved over time.
- Understanding of design issues associated with operating systems.
- Understand various process management concepts including scheduling, synchronization, and deadlocks.
- To have a basic knowledge about multithreading.
- To understand concepts of memory management including virtual memory.
- To understand issues related to file system interface and implementation, disk management.
- To understand and identify potential threats to operating systems and the security features design to guard against them
- .To have sound knowledge of various types of operating systems Unix .
- Describe the functions of a contemporary operating system with respect to convenience, efficiency, and the ability to evolve.

Course Contents

UNIT – I

(11 Lectures)

(Introduction to Operating System) What is Operating System? History and Evolution of OS, Basic OS functions, Resource Abstraction, Types of Operating Systems– Multiprogramming Systems, Batch Systems, Time Sharing Systems; Operating Systems for Personal Computers, Workstations and Handheld Devices, Process Control & Real time Systems.

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(12 Lectures)

(13 Lectures)

(Operating System Organization and Process Characterization) Processor and User Modes, Kernels, System Calls and System Programs, System View of the Process and Resources, Process Abstraction, Process Hierarchy, Threads, Threading Issues, Thread Libraries; Process Scheduling, Non-Preemptive and Pre- emptive Scheduling Algorithms.

UNIT-III

Process Management (Deadlock) Deadlock, Deadlock Characterization, Necessary and Sufficient for Deadlock, Deadlock Handling Approaches: Deadlock Prevention, Deadlock Conditions Avoidance and Deadlock Detection and Recovery.

UNIT-IV

(Inter Process Communication and Synchronization) Concurrent and Dependent Processes, Critical Section, Semaphores, Methods for Inter-process Communication; Process Synchronization, Classical Process Synchronization Problems: Producer-Consumer, Reader-Writer.

(Memory Management) Physical and Virtual Address Space; Memory Allocation Strategies-Fixed and -Variable Partitions, Paging, Segmentation, Virtual Memory.

References Books:

- 1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, (8th Ed), John Wiley Publications, (2008).
- 2. A.S. Tanenbaum, *Modern Operating Systems*, (3rd Ed), Pearson Education, (2007).
- 3. G. Nutt, Operating Systems, A Modern Perspective, (2nd Ed), Pearson Educatio, (1997).
- 4. W. Stallings, Operating Systems, Internals & Design Principles, (5th Ed), Prentice Hall of India.(2008)
- 5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill, (1992).

UNIT – V

(12 Lectures)

(12 Lectures)

UNIT – II

CSC-GE-004: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- Simulate the following CPU scheduling algorithms.
 a) FCFS b) SJF c) Round Robin d) Priority.
- 2. Write a C program to simulate producer-consumer problem using Semaphores
- 3. Write a C program to simulate the concept of Dining-philosophers problem.
- 4. Simulate MVT and MFT.
- 5. Write a C program to simulate the following contiguous memory allocation Techniques a) Worst fit b) Best fit c) First fit.
- Simulate all page replacement algorithms a)FIFO b) LRU c) OPTIMAL
- 7. Simulate all File Organization Techniquesa) Single level directory b) Two level directory
- 8. Simulate all file allocation strategiesb) Sequential b) Indexed c) Linked.
- 9. Simulate Bankers Algorithm for Dead Lock Avoidance.
- 10. Simulate Bankers Algorithm for Dead Lock Prevention.
- 11. Write a C program to simulate disk scheduling algorithms.a) FCFS b) SCAN c) C-SCAN

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CSC-GE-005: OBJECT ORIENTED PROGRAMMING

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- This course provides an introduction to object oriented programming (OOP) using the Java programming language.
- Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm
- Students completing the course should know:
- The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism
- Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections
- How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.
- How to test, document and prepare a professional looking package for each business project using javadoc.

Course Outcome

- Learn the concepts of data, abstraction and encapsulation
- Be able to write programs using classes and objects, packages.
- Understand conceptually principles of Inheritance and Polymorphism and their use and program level implementation.
- Learn exception and basic event handling mechanisms in a program
- To learn typical object-oriented constructs of specific object oriented programming language

Course Contents

UNIT – I

(11 Lectures)

Basics: Introduction to Object Oriented Programming and its Basic Features, Basic Components of C++, Characteristics of Object-Oriented Language, Structure of a C++ Program, Flow Control Statements in C++, Functions - Scope of Variables, Inline Functions, Recursive Functions, Pointers to Functions, C++ Pointers, Arrays, Dynamic Memory Allocation and De-Allocation

UNIT – II

(12 Lectures)

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UNIT – III

Class Inheritance, Base and Derived Classes, Virtual Base Class, Virtual Functions, Polymorphism, Static and Dynamic Bindings, Base and Derived Class Virtual Functions, Dynamic Binding through Virtual Functions, Pure Virtual Functions, Abstract Classes, Virtual Destructors

UNIT – IV

Stream Classes Hierarchy, Stream I/O, File Streams, Overloading the Extraction and Insertion Operators, Error Handling during File Operations, Formatted I/O.

UNIT – V

Exception Handling- Benefits of Exception Handling, Throwing an Exception, the Try Block, Catching an Exception, Exception Objects, Exception Specifications, Rethrowing an Exception, Uncaught Exceptions

Reference Books:

- 1. Object Oriented Programming with C++, Sourav Sahay, 2nd Edition, Oxford
- 2. The C++ Programming Language, B. Stroutstrup, 3rd Edition, Pearson Education
- 3. Programming in C++, Ashok N Kamthane. Pearson 2nd Edition

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(13 Lectures)

(12 Lectures)

(12 Lectures)

CSC-GE-005: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

Part A

- 1. Number of vowels and number of characters in a string.
- 2. Write a function called zeros maller () that is passed with two introduce arguments by reference and set the smaller of the number to zero. Write a man() program to access this function.
- 3. Demonstration of array of object.
- 4. Using this pointer to return a value (return by reference).
- 5. Demonstration of virtual function.
- 6. Demonstration of static function.
- 7. Accessing a particular record in a student's file.
- 8. Demonstration of operator overloading.

Part B

- 9. Write a program to create a database for students that contains Name, Enrolment no, Department, Programme using Constructors, destructors, input and output functions ; input and output for 10 people using different methods.
- 10. Create a class holding information of the salaries of all the family members (husband, wife, son, daughter). Using friend functions give the total salary of the family.

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CSC-GE-006: COMPUTER NETWORKS

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- After successfully completing this course, students should be able to:
- Describe the general principles of data communication.
- Describe how computer networks are organized with the concept of layered approach.
- Describe how signals are used to transfer data between nodes.
- Implement a simple LAN with hubs, bridges and switches.
- Describe how packets in the Internet are delivered.
- Analyze the contents in a given data link layer packet, based on the layer con¬cept.
- Design logical sub-address blocks with a given address block.
- Decide routing entries given a simple example of network topology
- Describe what classless addressing scheme is.
- Describe how routing protocols work.
- Use C programming language to implement network programs.
- Design and implement a network protocol.

Course Outcome

- Understand the structure of Data Communications System and its components. Be familiarize with different network terminologies.
- Familiarize with contemporary issues in network technologies.
- Know the layered model approach explained in OSI and TCP/IP network models
- Identify different types of network devices and their functions within a network.
- Learn basic routing mechanisms, IP addressing scheme and internetworking concepts.
- Familiarize with IP and TCP Internet protocols.
- To understand major concepts involved in design of WAN, LAN and wireless networks.
- Learn basics of network configuration and maintenance.
- Know the fundamentals of network security issues

Course Contents

UNIT – I

(12 Lectures)

Introduction to Computer Networks and Networking Elements: Network Definition, Network Topologies, Network Classifications, Network Protocol, Layered Network Architecture, Overview of OSI Reference Model, Overview of TCP/IP Protocol Suite, Hub, Switch (Managed and Unmanaged), Routers

UNIT – II

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(12 Lectures)

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(12 Lectures)

(12 Lectures)

(12 Lectures)

Data Communication Fundamentals and Techniques: Analog and Digital Signal, Data-Rate Limits, Digital to Digital Line Encoding Schemes, Pulse Code Modulation, Parallel and Serial Transmission, Digital to Analog Modulation - Multiplexing Techniques- FDM, TDM, Transmission Media.

UNIT – III

Networks Switching Techniques and Access Mechanisms: Circuit Switching, Packet Switching. Connectionless Datagram Switching, Connection- Oriented Virtual Circuit Switching; Dial-Up Modems, Digital Subscriber Line, Cable TV for Data Transfer.

UNIT – IV

Data Link Layer Functions and Protocol: Error Detection and Error Correction Techniques, Data-Link Control- Framing and Flow Control, Error Recovery Protocols-Stop and Wait ARQ, Go-Back-N ARQ, Point to Point Protocol on Internet.

UNIT – V

Multiple Access Protocol and Network Layer: CSMA/CD Protocols, Ethernet LANS; Connecting LAN and Back-Bone Networks- Repeaters, Hubs, Switches, Bridges, Router and Gateways, Networks Layer Functions and Protocols (6 Lectures) Routing, Routing Algorithms, Network Layer Protocol of Internet - IP Protocol, Internet Control Protocols.

Reference Books

- B. A. Forouzan: *Data Communications and Networking*, (4th Ed), THM Publishing Company Ltd, (2007)
- 2. A. S. Tanenbaum, Computer Networks, (4th Ed), PHI Pvt. Ltd, (2002).

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Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
- 2. Study of Network Devices in Detail.
- 3. Study of network IP.
- 4. Connect the computers in Local Area Network.
- 5. Study of basic network command and Network configuration commands.
- 6. Performing an Initial Switch Configuration
- 7. Performing an Initial Router Configuration
- 8. Configuring and Troubleshooting a Switched Network
- 9. Connecting a Switch
- 10. Configuring WEP on a Wireless Router
- 11. Using the Cisco IOS Show Commands
- 12. Examining WAN Connections
- 13. Interpreting Ping and Traceroute Output
- 14. Demonstrating Distribution Layer Functions
- 15. Placing ACLs
- 16. Exploring Different LAN Switch Options
- 17. Implementing an IP Addressing Scheme
- 18. Examining Network Address Translation (NAT)
- 19. Observing Static and Dynamic Routing
- 20. Configuring Ethernet and Serial Interfaces
- 21. Configuring a Default Route
- 22. Configuring Static and Default Routes
- 23. Configuring RIP
- 24. 24 Planning Network-based Firewalls
- 25. 25 Configuring a Cisco Router as a DHCP Server

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CSC-GE-007: ALGORITHMS

Credit: Theory: 04 Credits (60 Lectures), Practical: 02(60 Lectures)

Course Objectives

- 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.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Course Outcome

- To learn good principles of algorithm design;
- To learn how to analyse algorithms and estimate their worst-case and average- case behavior (in easy cases);
- To become familiar with fundamental data structures and with the manner in which these data structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles;
- To learn how to apply their theoretical knowledge in practice (via the practical component of the course).

Course Contents

UNIT – I

Introduction: Basic Design and Analysis Techniques of Algorithms, Correctness of Algorithm. Algorithm Design Techniques: Iterative Techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.

UNIT – II

(13 Lectures)

(10 Lectures)

Sorting and Searching Techniques: Elementary Sorting techniques– Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques- Heap Sort, Quick Sort, Sorting in Linear Time -Bucket Sort, Radix Sort and Count Sort, Searching Techniques- Medians & Order Statistics, complexity analysis

UNIT – III

(13 Lectures)

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Graphs Algorithms: Graph Algorithms– Breadth First Search, Depth First Search and its Applications, Minimum Spanning Trees. String Processing

UNIT – IV

(12 Lectures)

Lower Bounding Techniques: Decision Trees, Balanced Trees, Red-Black Trees

UNIT – V

(12 Lectures)

Advanced Analysis Technique: Randomized Algorithm, Distributed Algorithm, Heuristics

Reference Books

- 1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009
- 2. Sara basse & A.V. Gelder Computer Algorithm Introduction to Design and Analysis, Publisher – Pearson 3rd Edition 1999

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CSC-GE-007: PRACTICAL

Credit: Practical: 02 Credits (60 Lectures)

List Of Experiments:

- 1. Write a test program to implement Divide and Conquer Strategy . Eg: Quick sort algorithm for sorting list of integers in ascending order
- 2. Write aprogram to implement Merge sort algorithm for sorting a list of integers in ascending order.
- 3. Write program to implement the DFS and BFS algorithm for a graph.
- 4. Write program to implement backtracking algorithm for solving problems like N- queens ...
- 5. Write a program to implement the backtracking algorithm for the sum of subsets problem
- 6. Write program to implement greedy algorithm for job sequencing with deadlines.
- 7. Write aprogram to implement Dijkstra's algorithm for the Single source shortest path problem.
- 8. Write aprogram that implements Prim's algorithm to generate minimum cost spanning tree.
- 9. Write a program that implements Kruskal's algorithm to generate minimum cost spanning tree
- 10. Write program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
- 11. Write program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.

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CSC-GE-008: DATABASE MANAGEMENT SYSTEM

Credit: Theory: 04 Credits (60 Lecture), Practical: 02(60 Lectures)

Course Objectives

This course will help the students to

- Gain knowledge of database systems and database management systems software.
- Ability to model data in applications using conceptual modelling tools such as ER Diagrams and design data base schemas based on the model.
- Formulate, using SQL, solutions to a broad range of query and data update problems.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques.
- Compare, contrast and analyse the various emerging technologies for database systems such as NoSQL.
- Analyse strengths and weaknesses of the applications of database technologies to various subject areas.

Course Outcome

After completing the programme the students will be able to:

- Understand database concepts and structures and query language
- Understand the E R model and relational model
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
- Understand Functional Dependency and Functional Decomposition.
- Apply various Normalization techniques
- Perform PL/SQL programming using concept of Cursor Management, Error Handling, Package and Triggers
- Execute various advance SQL queries related to Transaction Processing & Locking using concept of Concurrency control.
- Understand query processing and techniques involved in query optimization.
- Understand the principles of storage structure and recovery management.

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• To apply the knowledge and understanding to the analysis of a given information handling problem.

Course Contents

UNIT – I

Introduction, Significance of Database, Database System Applications; Data Independence; Data Modeling for a Database; Entities and their Attributes, Entities, Attributes, Relationships and Relationships Types, Advantages and Disadvantages of Database Management System, DBMS Vs RDBMS.

UNIT – II

Three Level Architecture of DBMS, The External Level or Subschema, The Conceptual Level or Conceptual Schema, The Internal Level or Physical Schema, Mapping; MySQL Architecture; SQL Server 2000 Architecture; Oracle Architecture; Database Management System Facilities, Data Definition Language, Data Manipulation Language; Client / Server Architecture

(20 Lectures)

Data Model and Types of Data Model, Relational Data Model, Hierarchical Model, Network Data Model, Object/Relational Model, Object-Oriented Model; Entity-Relationship Model, Modeling using E-R Diagrams, Notation used in E-R Model, Relationships and Relationship Types; Associative Database Model

UNIT – IV

An informal look at the relational model; Relational Database Management System; RDBMS Properties, The Entity-Relationship Model; Overview of Relational Query Optimization; System Catalog in a Relational DBMS, Information Stored in the System Catalog, How Catalogs are Stored

UNIT – IV

Functional Dependency; Anomalies in a Database; Properties of Normalized Relations; First Normalization; Second Normal Form Relation; Third Normal Form; Boyce-Codd Normal Form (BNCF); Fourth and Fifth Normal Form; Basic Operations, Union, Difference,

UNIT – III

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(15 Lectures)

(11 Lectures)

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(6 Lectures)

(8 Lectures)

Intersection, Cartesian Product; Additional Relational Algebraic Operations, Projection, Selection, JOIN, Division

Reference books

- 1. R. Elmasri, S.B. Navathe, *Fundamentals of Database Systems* (6th Edition), Pearson Education, 2010.
- 2. R. Ramakrishanan, J. Gehrke, *Database Management Systems* (3rd Edition), McGraw-Hill, 2002.
- 3. A. Silberschatz, H.F. Korth, S. Sudarshan, *Database System Concepts* 6th Edition, McGraw Hill, 2010.
- 4. R. Elmasri, S.B. Navathe *Database Systems Models, Languages, Design and application Programming*, 6th Edition, Pearson Education, 2013.

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CSC-GE-008 (PRACTICAL)

Credit: Practical 02 Credits (60 Lectures)

List of Experiments

EMPLOYEE Schema

Field	Туре	NULL	KEY	DEFAULT
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
JobType	Varchar(50)	NO		NIL
Manager	Char(3)	YES	FK	NIL
HireDate	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

Department Schema

Field	Туре	NULL	KEY	DEFAULT
Dno	Integer	NO	PRI	NULL
Dname	Varchar(50)	YES		NULL
Location	Varchar(50)	YES		New Delhi

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Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.

2. Query to display unique Jobs from the Employee Table.

3. Query to display the Employee Name concatenated by a Job separated by a comma.

4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.

5. Query to display the Employee Name and Salary of all the employees earning more than \$2850.

6. Query to display Employee Name and Department Number for the Employee No= 7900.

7. Query to display Employee Name and Salary for all employees whose salary is not in the range of \$1500 and \$2850.

8. Query to display Employee Name and Department No. of all the employees in Dept 10 and

Dept 30 in the alphabetical order by name.

9. Query to display Name and Hire Date of every Employee who was hired in 1981.

10. Query to display Name and Job of all employees who don't have a current Manager.

11. Query to display the Name, Salary and Commission for all the employees who earn commission.

12. Sort the data in descending order of Salary and Commission.

13. Query to display Name of all the employees where the third letter of their name is _A'.

14. Query to display Name of all employees either have two _R's or have two _A's in their

name and are either in Dept No = 30 or their Manger's Employee No = 7788.

15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.

16. Query to display the Current Date.

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17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.

18. Query to display Name and calculate the number of months between today and the date each employee was hired.

19. Query to display the following for each employee <E-Name> earns < Salary> monthly but

wants < 3 * Current Salary >. Label the Column as Dream Salary.

20. Query to display Name with the 1st letter capitalized and all other letter lower case and length

of their name of all the employees whose name starts with _J', 'A' and _M'.

21. Query to display Name, Hire Date and Day of the week on which the employee started.

22. Query to display Name, Department Name and Department No for all the employees.

23. Query to display Unique Listing of all Jobs that are in Department.

24. Query to display Name, Dept Name of all employees who have an _A' in their name.

25. Query to display Name, Job, Department No. And Department Name for all the employees

working at the Dallas location.

26. Query to display Name and Employee no. Along with their Manger's Name and the Manager's

employee no; along with the Employees' Name who do not have a Manager.

27. Query to display Name, Dept No. and Salary of any employee whose department No. and salary matches both the department no. and the salary of any employee who earns a commission.

28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies \$100.

29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees

30. Query to display the number of employees performing the same Job type functions.

31. Query to display the no. of managers without listing their names.

32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.

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33. Query to display Name and Hire Date for all employees in the same dept. as Blake.

34. Query to display the Employee No. And Name for all employees who earn more than the average salary.

35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a T^{\prime} .

36. Query to display the names and salaries of all employees who report to King.

37. Query to display the department no, name and job for all employees in the Sales department.

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SKILL ENHANCEMENT COURSE

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CSC-SE-001: OFFICE AUTOMATION TOOLS

Credit: Theory: 01 Credits (15 Lectures), Practical: 01(30 Lectures)

Course Objectives

• The students will be enable to know about the fundamentals of computer and familiar with office automation tools and create documents, spread sheets and presentations .

Course Outcome

Upon successful completion of this course, Students will be able to

- Understand the structure and basic components of computer.
- Know about the processor structure and communication between memory and I/O devices
- Know about number representation and Conversions
- Know about Ms-Word and its features
- Familiar in working with spreadsheets and create their own powerpoint presentations

Course Contents

UNIT – I

(03 Lectures)

Excel basics : The usual spread sheet features, Overview of excel features, Getting Started, Creating a new work sheet, Selecting cells, Navigating with the mouse and keyboard, Entering and editing text, text boxes, text notes, checking spelling, undoing and repeating actions, entering and formatting numbers, entering and editing formulas, referencing cells, order of evaluation in formulas, look up tables, copying entries and equations to minimize typing, more auto fill examples, creating custom fill lists, protecting and un protecting documents and cells. Rearranging worksheets : Moving cells, copying cells, sorting cell data, inserting rows, inserting columns, inserting cells, inserting as you paste, deleting parts of a worksheet, clearing parts of a worksheet, how formulas react to worksheet design changes, Auditing tools help spot potential problems. Excel formatting tips and techniques : Excel page setup, Changing column widths and row heights, auto format, manual formatting, using styles, format codes alter a number's appearance, format painter speeds up format copying, changing font sizes and attributes, adjusting alignments, centering text across columns, using border buttons and commands, changing colors and shading, inserting and removing page breaks, hiding rows and columns. Organizing large projects : Using names, splitting windows and fixing titles, outlining your worksheets, working with multiple worksheets, using multiple worksheets in a workbook, viewing multiple windows, summarizing information from multiple worksheets. An introduction to functions : Parts of a function, functions requiring add-ins, online functions help, the function wizard, examples of functions by category, error messages from functions.

UNIT – II

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Rajiv Gandhi University Rono Hills, Doimukh (A.P.) (03 Lectures)

Excel's chart features : chart parts and terminology, instant charts with the chart wizard, creating charts on separate worksheets, resizing and moving charts, adding chart notes and arrows, editing charts, rotating 3-D charts, Changing worksheet values by dragging chart parts, printing charts, deleting charts, setting the default chart type, controlling which series on which axis, adding overlay charts, creating trend lines, data map. Working with graphics in Excel : Creating and placing graphic objects, resizing graphics, positioning graphics on worksheets, drawing lines and shapes, examples of graphics in Excel, possible sources of excel graphics, Excel slide shows.

Introduction to Excel's command macros : Recording your own macros, running macros, assigning macros to buttons. Using worksheets as databases : Database concepts and terms, Creating an excel database, Working with data forms, filtering—a better way to find, sorting excel databases, crosstabulating databases, adding subtotals to databases. Automating what-if projects : General organizational tips, scenario manager, finding the right number with solver.

Auditing and trouble shooting worksheets : Using error values to locate problems, using iteration to solve circular references, using the info window to find errors, using the auditing command to trouble shoot.

UNIT – III

(03 Lectures)

Introduction to Access : Access concepts and terms, starting and quitting access, the access workspace and tools, the views. Creating a simple database and tables : The access table wizard, creating databases without the wizard, field names, data types and properties, adding or deleting fields in tables, renaming fields and their captions, moving fields, deleting fields in tables, resizing fields, changing the appearance of text in tables, freezing columns, primary key fields, indexing fields, viewing a list of database properties, Forms : The form wizard, saving forms, modifying forms, Entering and editing data : Typing, adding records, duplicate previous entries without retyping, switching out of data entry mode, when do entries get saved?, undo, correcting entries, global replacements, moving from record to record in a table, entry and navigational shortcuts. Finding, sorting and displaying data : Queries and dynasets, creating and using select queries, returning to the query design, multiple search criteria, finding incomplete matches, using wildcards in queries, requesting range of records, hiding columns, reformatting dynasets, multilevel sorts, showing all records after a query, saving queries for latter use, cross tab queries, find and replace.

UNIT – IV

(03 Lectures)

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Printing reports, forms, letters and labels: simple table, form, and database printing, defining advanced reports, manual reporting and modifying, modifying section contents, properties in reports, saving report formats for reuse, printing mailing labels, changing label designs.

Relational databases : Flat versus relational, how relationships work, Exercise: creating a simple relationship, types of relationships, defining and redefining relationships, deleting relationships, creating relationships

Expressions, macros and other automation : Expressions, using expressions in reports, using expressions in queries, using expressions in forms, expression builders. Graphics in databases : Objects: linked, embedded, bound and unbound, unbound graphics as form and report embellishments, bound graphics in records, adding graphics to buttons, chart wizard: charting your data.

Linking, importing and exporting records : Importing versus linking, linking other databases as tables, importing data from spread sheet files, importing data from word files, exporting access data.

UNIT – V

(03 Lectures)

The Internet and the World Wide Web : Overview: what is Internet, The Internet's history, The Internet's major services, Understanding the world wide web, Using your browser and the world wide web, navigating the web, closing your browser, getting help with your browser, searching the web, search results and web sites.

E-mail and other Internet Services : Overview: communicating through the Internet, Using Email, Using an E-mail program, Stomping out spam, Using web-based e-mail services, More features of the Internet.

Connecting to the Internet: Overview: Joining the Internet phenomenon, Connecting to the Internet through wires, How PC applications access the Internet, Connecting to the Internet wirelessly.

Doing business in the online world : Overview: commerce on the world wide web, Ecommerce at the consumer level, E-commerce at the business level, Business, the Internet and every thing, Telecommuters.

Reference Books:

- 1. Michael Miller, Absolute Beginner's guide to computer Basics, Fourth Edition, Pearson Education (2007).
- 2. Deborah Morley, Charles S.Parker, understanding computers today and tomorrow, 11th Ed.

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CSC-SE-001: PRACTICAL

Credit: Practical: 01 Credits (30 Lectures)

List Of Experiments:

1. Study the features of MS-office MS-WORD:

- 2. Text formatting and table
- 3. Mail merge
- 4. Mathematical equations
- 5. Watermarking
- 6. Create backup file

MS-POWER POINT:

7. Create text and images with effects

8. Create animation and sound effects MS-EXCEL:

- 9. Create pay details of employee
- 10. Calculate student mark details
- 11. Create four types of chart
- 12. Import external data, sort & filter

MS-ACCESS

- 13. Create a database which consist of at least three tables
- 14. Queries
- 15. Form design
- 16. Report generation

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CSC-SE-002: INTRODUCTION TO WEB TECHNOLOGY

Credit: Theory: 01 (15 Lectures), Practical: 01(30 Lectures)

Course Objectives

- Get introduced to core parts of a web.
- Analyze a webpage, identify its elements and attributes
- Create webpage with HTML, XHTML and various cascading style sheets.
- Build dynamic webpages using JavaScript (client-side programming).
- Create XML documents and schemas.

Course Outcome

On completion of this course, students 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.
- Build interactive web applications using CSS2. Explain the principle of transaction management design.

Course Contents

UNIT – I

Introduction to WWW: Protocols and programs, secure connections, application and development tools, the web browser, what is server, choices, setting up UNIX and Linux web servers, Logging users, dynamic IP, Web Design: Web site design principles, planning the site and navigation.

UNIT – II

Introduction to HTML: The development process, Html tags and simple HTML forms, web site structure Introduction to XHTML: XML, Move to XHTML, Meta tags, Character entities, frames and frame sets, inside browser.

UNIT – III

Dynamic HTML: Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models.

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(04 Lectures)

(04 Lectures)

Style sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, CSS3

UNIT-IV

JavaScript:Client-side scripting, what is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition.

UNIT-V

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT.

Reference Books

- 1. Steven Holzner, HTML Black Book, Dremtech press.
- 2. Jeffrey C. Jackson , Web Technologies: A Computer Science Perspective, Prentice Hall, 2006.
- 3. Craif Knuckles, David Yuen, Web Applications: Concepts and Real-World Design, Wiley India Pvt Ltd, 2006.

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Rono Hills, Doimukh (A.P.

(02 Lectures)

(03 Lectures)

CSC-SE-002: PRACTICAL

Credit: Practical: 01 Credits (30 Lectures)

List Of Experiments:

- 1. Home page Development static pages (using Only HTML) of an online Book store.
- 2. Validate the Registration, user login and payment by credit card pages using JavaScript.
- 3. To write a program, which takes user id as input and displays the user details by taking the user information
- 4. from the XML document.
- 5. To create a JavaBean so that it converts value of INR(IndianRupees) into equivalent American/Canadian/Australian Dollar value.
- 6. To create a simple Bean with a label which is the count of number of clicks and a BeanInfo class such that only
- 7. the "count" property is visible in the Property Window.
- 8. To create two Beans Traffic Light which implemented as a Label with only three background coloursRed,Green,Yellow and Automobile which is
- 9. implemented as a TextBox which states its state/movement with above stated conditions.
- 10. To convert the static web pages online library into dynamic web pages using servlets and cookies.

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CSC-SE-003: ICT HARDWARE TECHNIQUES

Credit: Theory: 01 Credits (15 Lectures), Practical: 01(30 Lectures)

Course Objectives

If you do well in this module, you should be able to:

- Indicate the names and functions of hardware ports and the parts of the motherboard.
- Identify the names and distinguishing features of different kinds of input and output devices.
- Describe how the CPU processes data and instructions and controls the operation of all other devices.
- Identify the names, distinguishing features, and units for measuring different kinds of memory and storage devices.
- Search your personal computer for the various hardware components it contains.

Course Outcome

- Learning Outcomes Identify the hardware components of a computer.
- Lists the hardware components such as processor, memory, disk, main board, etc.
- Explains the features (speed, capacity, etc.) of the hardware components of a computer.
- Explains the relationships between the components of a computer and how data are transferred among the components.
- Identify the peripheral devices outside computer.
- Uses computer using input devices, such as keyboard and mouse.
- Transfers data outside the computer using output devices, such as screen and printer.
- Saves files to removable devices and loads files from removable devices.
- Connects to the Internet using network cards.
- identify the software running on a computer.
- Identifies BIOS and changes settings in BIOS.
- Lists jobs of operating system.
- Uses the Windows and Linux operating systems.
- Tests the performance of hardware components on some specific programs.

Course Contents

UNIT – I

(03 Lectures)

Evolution of computer system, Modern computer, Classification of computer, Personal Computer hardware: Monitor, Keyboard, Mouse, Scanner, printer, speaker

UNIT – II

(03 Lectures)

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Hard Disk Drive: logical structure and file system, FAT, NTFS. Hard disk tools: Disk cleanup, error checking, defragmentation, scanning for virus, formatting, installing additional HDD. New trends in HDD. Floppy Disk Drive

UNIT – III

Optical Media, CDROM, theory of operation, drive speed, buffer, cache, CD-R, CD-RW, DVD ROM, DVD technology, preventive maintenance for DVD and CD drives. Recent trends and developments in related technologies. Driver installation, Writing and cleaning CD and DVD.

UNIT – IV

Processor: Intel processor family. Latest trends in processor, Motherboard, Sockets and slots, power connectors. Peripheral connectors. Bus slots, USB, pin connectors. Different kinds of motherboards. RAM, different kinds of RAM. RAM upgradation. SMPS. BIOS.

UNIT – V

Network Interface Card, network cabling, I/O Box, Switches, RJ 45 connectors, Patch panel, Patch cord, racks, IP address.

Reference Books:

- 1. Comdex: Hardware and Networking Course Kit: Vikas Gupta: DreamTech press
- 2. PC hardware: A beginners Guide: Ron Gilster: Tata Mc Graw Hill.

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Rono Hills, Doimukh (A

(03 Lectures)

(03 Lectures)

(03 Lectures)

CSC-SE-003: PRACTICAL

Credit: Practical: 01 Credits (30 Lectures)

List Of Experiments:

- 1. Front panel indicators & switches and Front side & rear side Connectors.
- **2.** Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards.
- 3. Configure BIOS setup program and troubleshoot the typical problems using BIOS utility.
- 4. Install Hard Disk and configure to the Pc's
- **5.** Install and Configure a DVD Writer and a Blu-ray Disc writer and recording DVD and Blu-ray disk.
- 6. Printer Installation and Servicing and troubleshoot
- **7.** Install and configure Scanner, Web cam, Cell phone and bio-metric device with system and troubleshoot the problems
- **8.** Assemble a system with add on cards and check the working condition of the system and install OS. Install and Configure Dual OS Installation
- **9.** Assembling and Disassembling of Laptop to identify the parts and to install OS and configure it.

7

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CSC-SE-004: MOBILE APPLICATION DEVELOPMENT

Credit: Theory: 01 (15 Lectures), Practical: 01(30 Lectures)

Course Objectives

- Understand the concepts of android operating system and its development tools.
- Gain conceptual understanding of Android Activities and GUI Design Concepts
- Understand the concepts of Advanced UI Programming.
- Able to demonstrate their ability to develop software with reasonable complexity in mobile platform.

Course Outcome

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

- Install and configure Android application development tools.
- Design and develop user Interfaces for the Android platform.
- Save state information across important operating system events.
- Apply Java programming concepts to Android application development

Course Contents

UNIT – I

Introduction and Basics of Android, android Versions, features of android, architecture of android, the android market, Setting up development environment -android studio, android sdk, Android Virtual Device (AVD).

UNIT – II

Basic Building blocks Activities, Fragments, and Intents: understanding Activities, Activity Lifecycle, Application Manifest, Activity Example, Intents, Intent example, Fragments, life Cycle of a Fragment.

UNIT –III

Introduction to Android User Interface: Styles & Themes, Views and View groups, Types of Layout: Frame Layout, Linear Layout, Relative Layout, Table Layout, scroll View, Grid Layout ,constraint layout, units of measurement, display orientation, action bar.

UNIT – IV

Basic UI Design: Text View, Edit Text, Button, Image Button, Check Box, Toggle Button, Radio Button, Radio Group, Toggle Button, Progress Bar, AutoComplete Text Box ,timepickerView,DatepickerView,listViewView,spinnerView,Specialized fragment types, Alert Dialogs & Toast, Image View, Image Switcher view, Grid View, Web View, using menus With Views.

UNIT – V

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(02 Lectures)

(02 Lectures)

(04 Lectures)

(05 Lectures)

(02 Lectures)

Data Persistence: saving and loading user preferences, persisting data to files, Creating and using databases, Introducing SQLite. Content Providers: sharing Data in android, using a Content provider. Web Services: Receiving HTTP Response (XML, JSON), Parsing JSON and XML, Using Web View. Messaging: SMS Messaging, sending email, Location: Based Services- Displaying Maps, Google API for Maps, getting location Data.

Reference Books

- 1. J.F. DiMarzio, *Beginning Android Programming with Android Studio*, (4th Ed.), Wiley & Sons.
- 2. John Horton, Android Programming for Beginners Packt Publishing Limited (2015).
- 3. John Horton, Android Programming for Beginners, build in-depth, full-featured Android 9 Pie apps starting from zero programming experience, (2nd Ed.), Ingram short title (2018).
- 4. Reto Meier Paul, Professional Android 4 Application Development, Wiley, (2012).

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CSC-SE-004: PRACTICAL

Credit: Practical: 01 Credits (30 Lectures)

List Of Experiments: Minimum 15 Experiments need to be completed covering all the Units.

- 1. Design an application representing a simple calculator.
- 2. Develop an application for working with Menus and Screen Navigation.
- 3. Develop an application for working with Notifications.
- 4. Develop an application demonstrating Internal Storage to store private data on the device memory
- 5. Design a simple to-do list application using SQLite
- 6. Develop an application for connecting to the internet and sending email.
- 7. Develop an application for working with graphics and animation.
- 8. Develop an application for working with device camera.
- 9. Develop an application for working with location-based services.
- 10. Using Worker thread write Android code for a click listener that downloads an image from a separate thread and displays it in an Image View
- 11. Develop android program to implement login window using above UI controls.
- 12. Develop android program to implement Checkbox.
- 13. Develop android program to implement Radio Button and Radio Group.
- 14. Develop a program to implement Date and Time Picker.
- 15. Create an application to change screen color as per the user choice from a menu
- 16. Create an application that will display toast (Message) at some regular interval of time.
- 17. Create an application to insert, update and delete a record from the database.
- 18. Create an application to display "Hello World" string the number of times user inputs a numeric value. (Example. If user enters 5, the next screen should print "Hello World" five times.)
- 19. Develop a program for providing Bluetooth connectivity
- 20. Develop a program for providing Flash Light

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CSC-SE-005: PYTHON PROGRAMMING

Credit: Theory: 01 Credits (15 Lectures), Practical: 01(30 Lectures)

Course Objectives

The learning objectives of this course are:

- To understand why Python is a useful scripting language for developers.
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To learn how to identify Python object types.
- To learn how to use indexing and slicing to access data in Python programs.
- To define the structure and components of a Python program.
- To learn how to write loops and decision statements in Python.
- To learn how to write functions and pass arguments in Python.
- To learn how to build and package Python modules for reusability.
- To learn how to read and write files in Python.
- To learn how to design object- oriented programs with Python classes.
- To learn how to use class inheritance in Python for reusability.
- To learn how to use exception handling in Python applications for error handling.

Course Outcome

- Develop and Execute simple Python programs.
- Structure a Python program into functions.
- Using Python lists, tuples to represent compound data
- Develop Python Programs for file processing

Course Contents

UNIT – I

(03 Lectures)

Introduction to Python, Python, Features of Python, Execution of a Python, Program, Writing Our First Python Program, Data types in Python. Python Interpreter and Interactive Mode; Values and Types: int, float, boolean, string, and list; Variables, Expressions, Statements, Tuple Assignment, Precedence of Operators, Comments; Modules and Functions, Function Definition and use, Flow of Execution, Parameters and Arguments

UNIT – II

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(03 Lectures)

Operators in Python, Input and Output, Control Statements. Boolean Values and operators, Conditional (if), Alternative (if-else), Chained Conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful Functions: Return Values, Parameters, Local and Global Scope, Function Composition, Recursion

UNIT – III

Arrays in Python, Strings and Characters. Strings: String Slices, Immutability, String Functions and Methods, String Module; Lists as Arrays. Illustrative Programs: Square Root, gcd, Exponentiation, Sum an Array of Numbers, Linear Search, Binary Search.

UNIT – IV

Functions, Lists and Tuples. List Operations, List Slices, List Methods, List Loop, Mutability, Aliasing, Cloning Lists, List Parameters; Tuples: Tuple Assignment, Tuple as Return Value; Dictionaries: Operations and Methods; Advanced List Processing - List Comprehension; Illustrative Programs: Selection Sort, Insertion Sort, Merge sort, Histogram.

UNIT – V

Files and Exception: Text Files, Reading and Writing Files, Format Operator; Command Line Arguments, Errors and Exceptions, Handling Exceptions, Modules, Packages; Illustrative Programs: Word Count, Copy File.

Reference Books:

- 1. Mark Lutz, Learning Python
- 2. Tony Gaddis, Starting Out With Python
- 3. Kenneth A. Lambert, Fundamentals of Python
- 4. James Payne, Beginning Python using Python 2.6 and Python

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(03 Lectures)

(03 Lectures)

(03 Lectures)

CSC-SE-005: PRACTICAL

Credit: Practical: 01 Credits (30 Lectures)

List Of Experiments:

- 1. Write a program to demonstrate different number data types in Python.
- 2. Write a program to perform different Arithmetic Operations on numbers in Python.
- **3.** Write a program to create, concatenate and print a string and accessing sub-string from a given string.
- **4.** Write a python script to print the current date in the following format "Fri Oct 11 02:26:23 IST 2019"
- 5. Write a program to create, append, and remove lists in python.
- 6. Write a program to demonstrate working with tuples in python.
- 7. Write a program to demonstrate working with dictionaries in python.
- 8. Write a python program to find largest of three numbers.
- 9. Write a Python program to construct the following pattern, using a nested for loop
- 10. Write a Python script that prints prime numbers less than 20.
- **11.** Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
- **12.** Write a python program to define a module and import a specific function in that module to another program.

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- 13. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
- 14. Write a Python class to convert an integer to a roman numeral.15. Write a Python class to reverse a string word by word.

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CSC-SE-006: DIGITAL MARKETTING

Credit: Theory: 01 Credits (15 Lectures), Practical: 01(30 Lectures)

Course Objectives

- Analyze the confluence of marketing, operations, and human resources in real-time delivery.
- Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities.
- Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks.
- Investigate and evaluate issues in adapting to globalized markets that are constantly changing and increasingly networked.
- Interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.
- Comprehend the importance of conversion and working with digital relationship marketing.
- Analyse cross-cultural and ethical issues in globalized digital markets.

Course Outcome

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

- Analyze the confluence of marketing, operations, and human resources in real-time delivery.
- Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities.
- Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks.
- Investigate and evaluate issues in adapting to globalized markets that are constantly changing and increasingly networked.
- Interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.
- Comprehend the importance of conversion and working with digital relationship marketing.
- Analyze cross-cultural and ethical issues in globalized digital markets

Course Contents

UNIT – I

(3 Lectures)

Introduction of the digital marketing, Digital vs. Real Marketing, Digital Marketing Channel, Creating initial digital marketing plan, Content management, SWOT analysis, Target group analysis.

UNIT –II

(3 Lectures)

Internet Marketing and Digital Marketing– Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on Integrated Marketing Communication (IMC).

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UNIT – III

Search Engine Advertising: - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing: - Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing.

UNIT – IV

Social Media Marketing :Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools Linkedin Marketing: - Introduction and Importance of Linkedin Marketing, Framing Linkedin Strategy, Lead Generation through Linkedin, Content Strategy, Analytics and Targeting.

Twitter Marketing: Introduction to Twitter Marketing, how twitter Marketing is different than other forms of digital marketing, framing content strategy.

Twitter Advertising Campaigns Instagram and Snapchat: Digital Marketing Strategies through Instagram and Snapchat Mobile Marketing, Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics Introduction to social media metrics.

UNIT – V

Introduction to SEO, SEM, Web Analytics, Mobile Marketing, Trends in Digital Advertising, Introduction and need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics. Introduction to SEM Web Analytics: Google Analytics & Google AdWords; data collection for web analytics, multichannel attribution, Universal analytics, Tracking code.

Reference Books

- 1. Seema Gupta, Digital Marketing, McGraw Hill; Second edition, 2020.
- 2. Puneet Bhatia, Fundamentals of Digital Marketing, Pearson, Second Edition, 2019.
- 3. Ian Dodson, The Art of Digital Marketing, Wiley; 1st edition, 2016.
- 4. Vandana Ahuja, *Digital Marketing*, Oxford University Press; Illustrated edition, 2015.
- 5. Philip Kotler, Marketing 4.0 Moving from Traditional to Digital, Pan Macmillan, 2017.

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(3 Lectures)

(3 Lectures)

(3 Lectures)

CSC-SE-006: PRACTICAL

Credit: Practical: 01 Credits (30 Lectures)

List Of Experiments: Minimum 10 Experiments need to be completed covering all the Units.

- 1. Digital Marketing Implementation in Business Scenario
- 2. Create the Digital Marketing Webpage
- 3. Conducting the Search Engine Optimization and Search Engine Marketing
- 4. Using Google Analytics to analyze website performance
- 5. Creating Promotional banner through Canva
- 6. Facebook Promotion using banners
- 7. Creating YouTube Channel for Marketing
- 8. Twitter Marketing
- 9. Instagram Marketing
- 10. Email Marketing
- 11. Digital Marketing Final Analysis and Report

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ABILITY ENHANCEMENT COURSE

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ENG-AE-111 COMMUNICATIVE ENGLISH

Credit: Theory-04 : L-3:T1:P0

Course Objectives

- The course aims to train learners to be more effective at communicating successfully in interviews, public speaking, letter writing, report writing, presentations, and inter-personal debates and conversations.
- The learner also imbibes the fundamentals of communication and the art of persuasive speaking and writing which depends crucially on clarity of thought and contextual understanding expressed through appropriate vocabulary.

Course Outcome

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

- Identify deviant use of English both in written and spoken forms
- Recognize the errors of usage and correct them and write simple sentences without committing errors of spelling and grammar
- Developing own competence in using the language
- Understand and appreciate English spoken by others
- Use language for speaking with confidence in an intelligible and acceptable manner
- Understand the importance of reading for life and develop an interest for reading
- Read independently unfamiliar texts with comprehension
- Understand the importance of writing in academic life and career.

Course Contents

UNIT – I

Poetry: William Shakespeare – All the World is a stage; William Wordsworth – I wondered lonely as a Cloud; Ralph Waldo Emerson – The Mountain and the Squirrel; Emily Dickinson – Success is Counted Sweetest; Robert Frost - Stopping by Woods on a Snowy Evening; Rabindranath Tagore – Where the Mind is without Fear; A. K. Meherotra – Songs of the Ganga.

UNIT –II

Short Stories: R.K. Narayan – Lawly Road; Mulk Raj Anand – Barbar's Trade Union; Somerset Mangham – The Luncheon; Guy De. Maupassant – The Necklace; Anton Chekhov – The Lament; O' Henry – The Last Leaf; Manoj Das – The Submerged Valley.

UNIT – III

One-Act Plays and Short Fiction: (a) Norman Mckinnell - The Bishop's Candle Sticks; Anton Chekov – A Marriage Proposal; Eugene Lonesco – The Lesson; August Strandberg – Miss Jullie; Fritz Karinthy– Refund; (b) Harper Lee – To kill a Mocking Bird, (Or) R. K. Narayan – Vendor of Sweets.

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UNIT – IV

Fundamentals of Grammar: Parts of speech, Articles and Intensifiers, use of tense forms, Use of Infinitives, Conditionals, Adjectives and Adverbs, Prepositions, Making Affirmative, Negative and Interrogative, Making Question Tag.

UNIT – V

Composition Practice: (a) Comprehension, Précis Writing, Paragraph Writing (150 words), Letter writing – Personal, Official, Demi-official, Business, Public speaking, Soft Skills, Interviews, Preparing Curriculum Vitae, Report (Meetings and Academic) writing; (b) Communication Practice – Introducing yourself, Introducing people to others, Meeting People, Exchanging Greetings, Taking Leave, Answering the Telephone, Asking Someone for Some Purpose, Taking and Leaving Messages, Call for help in emergency.

Practical Exercises:

The students are required to:

- 1. Know dictionary and its types, mapping a dictionary to locate words, and multiple uses of dictionary/ies
- 2. Know the uses of Thesaurus/Lexicon/Activator/Encyclopaedia
- 3. Know Note making/taking
- 4. Know information transfer exercises
- 5. Know the usage library resources properly
- 6. Know citing references or developing a bibliography
- 7. Edit a piece of self and peer writing, writing and revising the drafts and preparing the final draft

8. Understand and appreciate the principle of politeness in relation to the speaker/ listener, debating, ex-

tempore speeches, and other discourses.

Reference Books

- 1. For reading the texts available sources of texts and help of the Web source may be taken.
- 2. Crystal, David (1985) Rediscover Grammar with David Crystal. Longman.
- 3. Hewings, M. (1999) Advanced English Grammar. Cambridge University Press.
- 4. Bakshi, R. N. A course in English Grammar, Orient Longman
- 5. Krishnaswamy, N. Modern English A Book of Grammar, Usage and Composition. MacMillan India Ltd.
- 6. Bailey, Stephen (2003). Academic Writing. London and New York, Routledge.
- 7. Grellet, F (1981). Developing Reading Skills: A Practical Guide to Reading Skills. New York, CUP
- 8. Hedge, T. (2005). Writing. London, OUP
- 9. Kumar, S and Pushp Lata (2015). Communication Skills. New Delhi, OUP
- 10. Lazar, G. (2010). Literature and Language Teaching. Cambridge, CUP
- 11. Nuttall, C (1996). Teaching Reading Skills in a Foreign Language. London, Macmillan
- 12. Raman, Meenakshi and Sangeeta Sharma (2011). Technical Communication: Principles and Practice. New Delhi, OUP

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HIN-AE-111 हिंदी शिक्षण (Hindi Sikshan(

Credit: Theory-04 : L-3:T1:P0

Course Objectives/ उद्देश्यः

- राष्ट्रीय एवं अन्तरराष्ट्रीय परिप्रेक्ष्य में हिन्दी का महत्त्व; मानक हिन्दी और बोलचाल की हिन्दी में अन्तर; स्वागत भाषण, भाषण, विषय प्रवर्तन तथा धन्यवाद ज्ञापन।
- आलेख रचनाः सम्पादक के नाम पत्र, सम्पादकीय लेखन, स्तम्भ लेखन, पत्रपत्रिकाओं के लिये आलेख -रचनाः आकाशवाणी एवं दूरदर्शन हेत् वार्ता, साक्षात्कार एवं परिचर्चा तैयार करने की विधियाँ ।
- व्यावहारिक लेखन: कार्यालयी पत्राचार; प्रेस विज्ञप्ति; सूचना ; ज्ञापन; कार्यसूची; कार्यवृत्त;
 प्रतिवेदन; सम्पादन; संक्षेपण; आत्मविवरण तथा ईमेल लेखन-, फेसबुक, ब्लॉग और ट्वीटर लेखन।
- सृजनात्मक लेखन: कविता, कहानी, नाटक तथा एकांकी, निबंध, यात्रावृत का स्वरूप विवेचन ।

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Course Outcome/उपलब्धियां

हिंदी शिक्षण से सम्बन्धित इस पत्र में विद्यार्थी हिन्दी भाषा के व्यावहारिक स्वरूप तथा प्रयोजनमूलक हिन्दी के क्षेत्र लेखन से जुड़ी बहुविध जानकारियों से परिचित हुए। हिन्दी भाषा की बढ़ती लोकप्रियता और बढ़ते अन्तरराष्ट्रीय महत्त्व के सन्दर्भ में हिन्दी भाषा आधारित कौशल विकास से विद्यार्थियों को अवगत कराया गया। विशेषकर आलेख रचना के अतिरिक्त व्यावहारिक एवं सर्जनात्मक लेखन से जुड़ी बारीकियों को जान सके।

Course Contents

इकाई 1:

(व्याख्यान-10)

राष्ट्रीय एवं अन्तरराष्ट्रीय परिप्रेक्ष्य में हिन्दी का महत्त्व; मानक हिन्दी और बोलचाल की हिन्दी में अन्तर; स्वागत भाषण, भाषण, विषय प्रवर्तन तथा धन्यवाद ज्ञापन ।

इकाई 2:

(व्याख्यान-10)

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आलेख रचना: सम्पादक के नाम पत्र, सम्पादकीय लेखन, स्तम्भ लेखन, पत्रपत्रिकाओं के लिये -आलेख रचना; आकाशवाणी एवं दूरदर्शन हेतु वार्ता, साक्षात्कार एवं परिचर्चा तैयार करने की विधियाँ ।

इकाई 3:

(व्याख्यान-10)

व्यावहारिक लेखनः कार्यालयी पत्राचार; प्रेस विज्ञप्ति; सूचना ; ज्ञापन; कार्यसूची; कार्यवृत्त; प्रतिवेदन; सम्पादन; संक्षेपण; आत्मविवरण तथा ईमेल लेखन-, फेसबुक, ब्लॉग और ट्वीटर लेखन।

इकाई 4:

(व्याख्यान-10)

सृजनात्मक लेखन: कविता, कहानी, नाटक तथा एकांकी, निबंध, यात्रावृत का स्वरूप विवेचन ।

सहायक ग्रन्थ

1.	अच्छी हिन्दी	: रामचन्द्र वर्मा
2.	व्यवहारिक हिन्दी व्याकरण और रचना	ः हरदेव बाहरी
3.	हिन्दी भाषा	ः डॉ भोलानाथ तिवारी
4.	रेडियों लेखन	ः मधुकर गंगाधर
5.	टेलीविजनः सिद्धान्त और टैकनिक	ः मथुरादत्त शर्मा
6.	प्रयोजनमूलक हिन्दी	ः डॉदंगल झाल्टे
7.	सरकारी कार्यालयों में हिन्दी का प्रयोग	: गोपीनाथ श्रीवास्तव, राजकमल, दिल्ली
8.	टेलीविजन लेखन	: असगर वजाहत / प्रेमरंजन; राजकमल, दिल्ली
9.	रेडियो नाटक की कला	ः डॉ सिद्धनाथ कुमार, राजकमल, दिल्ली
10.	रेडियो वार्ता शिल्प	: सिद्धनाथ कुमार, राजकमल, दिल्ली

सयुक्त कुलसचिव (शैक्षणिक एवं सम्मेलन) राजीव गांधी विश्वविद्यालय Jt. Registrar (Acad. & Conf.) Rajiv Gandhi University Rono Hills, Doimukh (A.P.)

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EVS-AE-121: ENVIRONMENTAL STUDIES

Credit: Theory-04 : L-4(60 Lectures);

Course Objectives

The objective of this paper is to provide basic concept of on Environment, Ecology, Natural • Resources, Importance of biodiversity and need for their conservation along with various environmental issues and Govt. policies, and Environmental movements.

Course Outcome

- Learners will be able to understand environment science and its importance. •
- Learners will understand the various types of pollution and hazards caused by them.
- Learners will understand ways to monitor environment and the various green technologies.
- Learners will know the various Acts enacted for the protection of the environment.

Course Contents

UNIT-I

Environment: Definition, scope and importance; Multidisciplinary nature of environmental studies. Concept of sustainability and sustainable development, Ecosystem – Concept, Structure and function; Energy flow in an ecosystem: food chains, food webs, ecological pyramid. Ecological succession. Ecosystem services.

UNIT-II

Land as a resource, Land use patterns, land degradation, soil erosion and desertification. Forest Resources, Use and over-exploitation; Deforestation - causes and impacts on environment. Water Resources, Use and overexploitation of surface and ground water; floods, droughts, Case studies on conflicts over water (international & inter-state). Energy Resources, Renewable and non-renewable energy sources, growing energy needs, use of alternate energy sources. Traditional ecological knowledge.

UNIT - III

Biodiversity: Definition, levels (genetic, species and ecosystem diversity) and values; Biogeographic zones of India; Biodiversity hot spots. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

UNIT-IV

Environmental pollution: types, causes, effects and controls of Air, water, soil, noise, solid waste and nuclear pollution. Global environmental issues: Climate change, global warming, ozone layer depletion, acid rain and

(12 Lectures)

(12 Lectures)

(12 Lectures)

(24 Lectures)

impacts on human communities and agriculture. Salient features of Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Paris agreement, Nagoya Protocol. Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare. Disaster management: Floods, Earthquake, Cyclones and Landslides. Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.

Reference Books

- 1. Bharucha, E. 2020. Textbook for Environmental Science for undergraduate students. University Grants Commission, New Delhi.
- 2. Gupta Abhik and Gupta Susmita. 2021. Environmental Studies: Principles and Practices. 344 pages, SAGE Texts.
- 3. Ahluwalia, V.K.. Environmental Studies. 2nd Ed. TERI Press.
- 4. Kaushik Anubha and Kaushik, C.P. 2018. Perspectives in Environmental Studies. 6th Ed. New Age International Pvt. Ltd.
- 5. Krishnamurthy, K. V. 2020.An advanced textbook on Biodiversity: Principles and Practice. CBS Publisher and Distributors
- 6. Ambasht, R. S. and Ambasht, P.K. 2017. Environment and Pollution an Ecological Approach 5th Ed. CBS Publisher and Distributors.
- 7. Ambasht, R. S. and Ambasht, N.K. 2017. A textbook of Plant Ecology. 15th Ed. CBS Publishers and Distributors, New Delhi.
- 8. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.

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