Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Syllabus for

S.Y.B.Tech.

(Computer Engineering)

Department of Computer Engineering

Vision and Mission of the Department

- **Vision**

  "Excellence in the field of Computer Engineering for rendering services to the industry and society".

- **Mission**

  - To empower our students for substantial contribution to **economical**, **technological**, **entrepreneurial** and **social progress** of the society.
  - To strive for excellence at **different levels** and **diverse** dimensions in the field of computer engineering.
  - To encourage students to pursue **research** and **advanced studies** for better adaptability towards **globalization**.

Program Specific Outcomes (PSOs)

At the end of program, students should be able to

- **PSO a:** Use knowledge to write programs and integrate them with the hardware/software products in the domains of embedded systems, data Science, networking and web technology.
- **PSO b:** Participate in planning and implement solutions to cater to business – specific requirements, displaying team dynamics and professional ethics.

Program Outcomes (POs)

At the end of program, students should be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, social and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

S.Y.B.Tech.

Pattern 2017

Syllabus Structure

Second Year B.Tech. Computer Engineering (SYBT) - Semester I (Pattern 2017)

Course Code	Course	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
						Formative Assessment			Summative Assessment			
			L	T	P	ISE T1	ISE T2	CE	ESE	PR/ OR		
CSUA21171	Discrete Structures & Graph Theory	TH	4	-	-	15	15	20	50	-	100	4
CSUA21172	Discrete Structures & Graph Theory – Practice	CE	-	1	-	-	-	50	-	-	50	1
CSUA21173	Computer Organization And Microprocessors Techniques	TH	3	1	-	15	15	20	50	-	100	4
CSUA21174	Fundamentals of Data Structure*	TH	3	-	-	15	15	20	50	-	100	3
CSUA21175	Digital Systems and Logic Design*	TH	3	-	-	15	15	20	50	-	100	3
CSUA21176	Object Oriented Programming*	TH	3	-	-	15	15	20	50	-	100	3
CSUA21177	Lab Practice-I	CE-PR/OR	-	-	6	-	-	50	-	50	100	3
CSUA21178	Skill Development I (Data Structure using C++)	CE	-	-	2	-	-	50	-	-	50	1
CSUA21179	Environment Studies	CE	1	-	2	-	-	50	-	-	50	2
A	Audit Course	-	-	-	-	-	-	-	-	-	-	-
	Total	-	**17**	**2**	**10**	**75**	**75**	**300**	**250**	**50**	**750**	**24**

Lecture : 1Hr. = 1 Credit, Practical: 2 Hrs. = 1 Credit, Tutorial : 1 Hr. = 1 Credit, Audit Course: No Credits
*Courses have lab practice component of 2 hrs./week each under Lab Practice head.

Audit Courses: Professional Ethics; Cyber Security; Value Engineering and Human Rights; Legislative Procedures; Technical Writing/Documentation; Sports/Yoga; Performing Art such as music, dance, and drama etc.; Languages; Online certification course (minimum two weeks); Participation in intercollegiate co-curricular and extra-curricular activities.

BoS Chairman **Dean Academics** **Director**

Second Year B.Tech. Computer Engineering (SYBT) - Semester II (Pattern 2017)

Course Code	Course	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
						Formative Assessment			Summative Assessment			
			L	T	P	ISE T1	ISE T2	CE	ESE	PR/ OR		
CSUA22171	Engineering Mathematics III	TH	4	-	-	15	15	20	50	-	100	4
CSUA22172	Mathematics Practice – III	CE	-	1	-	-	-	50	-	-	50	1
CSUA22173	Data Structure and Files*	TH	3	-	-	15	15	20	50	-	100	3
CSUA22174	Computer Graphics*	TH	3	-	-	15	15	20	50	-	100	3
CSUA22175	Fundamentals of Data Communication*	TH	3	-	-	15	15	20	50	-	100	3
CSUA22176	Social Science and Engineering Economics	TH	3	-	-	15	15	20	50	-	100	3
CSUA22177	Lab Practice-II	CE-PR/OR	-	-	6	-	-	50	-	50	100	3
CSUA22178	Skill Development II (Advanced Data Structure using C++)	CE	-	-	2	-	-	50	-	-	50	1
CSUA22179	Project Management	CE	2	-	-	-	-	50	-	-	50	2
A	Audit Course	-	-	-	-	-	-	-	-	-	-	-
	Total	-	**18**	**1**	**8**	**75**	**75**	**300**	**250**	**50**	**750**	**23**

Lecture : 1Hr. = 1 Credit, Practical: 2 Hrs. = 1 Credit, Tutorial : 1 Hr. = 1 Credit, Audit Course: No Credits
*Courses have lab practice component of 2 hrs./week each under Lab Practice head.

Audit Courses: Professional Ethics; Cyber Security; Value Engineering and Human Rights; Legislative Procedures; Technical Writing/Documentation; Sports/Yoga; Performing Art such as music, dance, and drama etc.; Languages; Online certification course (minimum two weeks); Participation in intercollegiate co-curricular and extra-curricular activities.

BoS Chairman **Dean Academics** **Director**

S.Y.B.Tech.

Pattern 2017

Syllabus

Discrete Structures & Graph Theory (CSUA21171)

Teaching Scheme
Credits : 4
Lectures : 4 Hrs/week

Examination Scheme
Formative assessment : 50 Marks
Summative assessment : 50 Marks

Prerequisites : Basic Algebra

Course Objectives

- To study basic of logic and set theory
- To understand notion of functions and relations
- To study fundamental principles of graphs
- To study fundamental principles of trees elementary combinatorial processes
- To study fundamental principles of probability theory

Course Outcomes

After completion of the course, student will be able to

1. Demonstrate use of logical arguments, proof techniques and set theory principles
2. Determine type, properties and solution of relations and functions
3. Solve the problems using graph methods and algorithms
4. Apply tree models and methods to obtain solutions of applications involving searching, prefix code and vertex connectivity
5. Apply principles of counting to obtain solution to counting problems
6. Apply probability theory, principles and distributions in problem

Unit I - Mathematical Logic and Set Theory

Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy Sets, Combination of sets, Venn Diagrams, Finite and Infinite sets, Uncountably infinite sets, Principle of inclusion and exclusion, multisets .

Unit II - Functions and Relations

Functions, Composition of functions, Invertible functions, Discrete Numeric functions and Generating functions, Job scheduling Problem.

Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence Relations and Partitions, Partial ordering relations and Lattices, Chains and Anti-chains.

Recurrence Relations : Recurrence Relation, Linear Recurrence Relations with constant Coefficients, Homogeneous Solutions, Total solutions, Solutions by the method of generating functions

Unit III – Graphs

Basic terminology, Representation of graph in computer memory, Multigraphs and Weighted graphs, Subgraph, Isomorphic graph, Complete ,Regular and Bipartite graphs, Operation on graph, Paths and

Circuits, Hamiltonian and Euler paths and circuits, Shortest path in weighted Graph (Dijkstra's algorithm), Factors of a graph, Planar graph and Travelling salesman problem, Graph coloring.

Unit IV - Trees

Trees, Rooted trees, Path length in rooted trees, Prefix codes and optimal prefix codes, Binary search trees, Tree traversals, Spanning trees, Fundamental circuits and cut set, Minimal spanning trees, Kruskal's and Prim's algorithms for minimum spanning tree, The Max flow –Min cut theorem (transport network).

Unit V – Counting

Permutations and Combinations: Rule of sum and product, Pigeonhole principle, Permutations, Combinations, Binomial Coefficients and identities, Algorithms for generation of Permutations and Combinations.

Unit VI - Discrete Probability

Discrete Probability, Conditional Probability, Bayes' Theorem, Random variable, Random process, Mean, Mode, Variance, Probability distributions: Binomial trials and Distribution, Binomial probability distribution, Poisson probability distribution, Gaussian probability distribution,

Text Books

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 6th edition, McGraw-Hill, 2007. ISBN 978-0-07-288008-3.
2. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", 6th edition,TataMcGraw-Hill, 2008, ISBN 10:0-07-066913-9.

Reference Books

1. R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education, 2001 ISBN 81 –7808 – 279 – 9.
2. B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures", 4th Edition, Pearson Education, 2002, ISBN 81-7808-556-9
3. N. Deo, "Graph Theory with application to Engineering and Computer Science", Prentice Hall of India, 1990, 0 – 87692 – 145 – 4
4. Eric Gossett, "Discrete Mathematics with proof", 2nd edition, Wiley Student Edition, ISBN: 978-81-265-2758-8

Course Coordinator

BoS Member

BoS Chairman

Discrete Structures & Graph Theory - Practice (CSUA21172)

Teaching Scheme
Credits : 1
Lectures : NA
Tutorials : 1 Hr/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : NA

Course Objectives

- To study basic of logic and set theory
- To understand notion of functions and relations
- To study fundamental principles of graphs
- To study fundamental principles of trees elementary combinatorial processes
- To study fundamental principles of probability theory

Course Outcomes

After completion of the course, student will be able to

1. Demonstrate use of logical arguments, proof techniques and set theory principles
2. Determine type, properties and solution of relations and functions
3. Solve the problems using graph methods and algorithms
4. Apply tree models and methods to obtain solutions of applications involving searching, prefix code and vertex connectivity
5. Apply principles of counting to obtain solution to counting problems
6. Apply probability theory, principles and distributions in problem

List of Tutorials

Assignment 1 : Mathematical Logic and Set Theory

1. A survey on sample 25 new cars being sold out at a local auto dealer was conducted to see which of three popular option Air Conditioner (A), Radio (R), Power Windows(W) were already installed. The survey found 15 had Air Conditioners, 12 had Radios, and 11 had Power Windows. 5 had Air Conditioner and Power Windows, 9\ had Air Conditioner and Radio, 4 had Radio and Power Windows. Three had all three options. Find number of cars which had:

(i) only one of the option
(ii) at least one of the option
(iii) none of the options.

Use principle of inclusion exclusion

2.Draw Venn diagram and prove the expression.

3.Prove by induction that for all n > = 1

$$1.2 + 2.3 + \ldots\ldots\ldots\ldots + n(n+1) = \frac{n(n+1)(n+2)}{3}$$

4 Show that $(p \wedge q) \rightarrow (p \rightarrow q)$ is a tautology.

5 Consider the following:
p : This system is good

q : This system is cheap
Write each of the following statement in symbolic form.
(i) This system is good and cheap
(ii) This system is not good but cheap
(iii) This system is neither good nor cheap
(iv) This system is good or cheap

6. A survey has been taken on modes of travels. Each respondent was asked to check bus, train or automobile as major modes of travelling for work. More than one answer was permitted. The result, reported outcome were as follows:
Bus-40 people, train-45 people, automobile-100 people, bus and train-20 people, bus and automobile-15 people, train and automobile-20 people and all three modes-5 people. How many people completed a survey from? Apply principle of inclusion and exclusion.

7.Use mathematical induction to show that:

$$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\cdots\ldots\ldots\ldots+\frac{1}{n(n+1)}=\frac{n}{n+1} \quad \text{for all } n \geq 1$$

8. Define the terms Universal Quantifier and Existential Quantifier.

Assignment 2 : Functions and Relations

1. Draw Hasse diagram for any relation. Determine the chains and anti-chains.

2. Let A={1,2,3} and B={a,b,c,d}. In each case state whether the given function (if defined) is injective, surjective, bijective.
f={(1,a),(2,d),(3,b)} g={(1,a),(2,a),(3,d)}
h={(1,a),(1,b),(2,d),(3,c)} j={(1,a),(2,b)}

3. Find homogeneous solution of a recurrence relation:
$a_n=11a_{n-1} - 39a_{n-2} + 45a_{n-3}$ for $a_0=5$, $a_1=11$, $a_2=25$.

4. Find the transitive closure of R by Warshall's algorithm.
Where A={1,2,3,4,5,6} and R={(x-y);|x-y|=2}

5. Explain with example –
i) Equivalence relation
ii) Partial ordering relation

6. Consider the following relation on {1, 2, 3, 4, 5, 6}: R= {(i, j) | |i-j|=2 }
Is R transitive? Is R reflexive? Is R symmetric?

7. Let f, g, h be the functions from N to N, where N is the set of natural numbers so that f(n)=n+1, g(n)=2n, h(n)=0 if n is even and h(n)=1 if n is odd.

Determine fof, fog, gof, goh, hog, fogoh
8. Let R be the relation on the set A. A={ 5,6,8,10,28,36,48}. Let R={(a,b)| a is a divisor of b}. Draw the Hasse diagram. Compare with diagraph. Determine whether R is equivalence relation.
Assignment 3 : Graphs
1.Solving the shortest path by using Dijkstra's algorithm in any graph..
2.Define following terms with suitable examples: 1. Planar Graph 2. Complete Graph 3. Connected and Disconnected Graph
3.Show that in a connected planar graph with 6 vertices and 12 edges, each of the regions is bounded by 3 edges.
4.Explain adjacency matrix and adjacency list with example.
5.Explain term eulerian path and circuit with example.
6. Explain multigraph with example.
7. Define Graph Kn,Kmn.
8. Find whether K6 and K3,3 graphs are isomorphic or not.
Assignment 4 : Trees
1. Draw binary search tree for input data 200,100,300,50,150,400,10,75,125,175. Which is a root, leaf nodes and interior nodes?
2. For any sets of weights construct an optimal binary Prefix code.
3. 19 lamps are to be connected to single electrical outlet, using extension Chords , each of which has 4 outlets. Find the number of extension chords needed and draw corresponding tree.
4. Find the minimum cost spanning tree of any graph using Prim's algorithm.
5. Find the minimal flow in any transport network using labeling procedure. Determine the corresponding minimum cut
6. Use Kruskal's algorithm to find minimum spanning tree(MST) of any given graph.
7. Draw the unique binary tree when inorder and preorder traversal of tree is given.

8. What is total number of nodes in a full binary tree with 20 leaves?
Assignment 5 : Counting
1. In how many ways can seven men and seven women sit down at a round table in such a way that no two men sit next to each other?
2. One card is drawn from a pack of cards. Express each of the following probabilities: a. The card is the king of diamonds b. The card is ace c. The card is 9 or 10 d. The card is a spade
3. A bag contains 3 red & 5 black balls & second bag contains 6 red & 4 black balls. A ball is drawn from each bag. Find the probability that: a. Both are red b. Both are black c. 1 is red & 1 is black
4. Find the number of arrangements that can be made out of the letters: a. ASSASSINATION b. GANESHPURI
5. A pair of dice is thrown. Find the probability that the sum is 10 or greater if: a. 5 appears on first die. b. 5 appear on at least one die.
6. Show that if 7 colours are used to paint 50 bicycles, atleast 8 bicycles will be the same colour.
7. Suppose repetitions are not permitted a. How many ways three digits numbers can be formed from six digits 2,3,4,5,7,9 ? b. How many of these numbers are less than 4000.
8. Explain Pigeonhole Principle.
Assignment 6 : Discrete Probability
1. In a certain group of Engineers, 60% have insufficient background of information theory, 50% have inadequate knowledge of probability & 70% in either one or both of the two categories. What is the % of people who know probability among those who have a sufficient background of information theory? Find the mutual information between these two categories.
2.If on an average one candidate out of ten fails in a certain examination, then find the probability that out of 5 candidate that have appeared for examination, at least 4 will be successful.
3. In a bolt factory, there are four machines A, B, C, D manufacturers 20%, 25%, 10% & 45% of the

total bolts respectively 2% of the bolts manufactured by A, 4% by B, 2% by C & 5% by D are found to be defective. A bolt is chosen at random and is found to be defective. What is the probability that is manufactured by C?
4. The owner of the restaurant is interested in how much people spend at the restaurant. He examines 10 randomly selected receipts for parties of four and writes down the following data. 44, 50, 38, 96, 42, 47, 40, 39, 46, 50 Find mean, mode and variance.
5. A company makes electric motors. The probability an electric motor is defective is 0.01. What is the probability that a sample of 300 electric motors will contain exactly 5 defective motors?
6. Explain Gaussian Probability Distribution.
7. Explain the terms random variables and random process.
8. In a certain group of Engineers, 60% have insufficient background of information theory, 50% have inadequate knowledge of probability & 70% in either one or both of the two categories. What is the % of people who know probability among those who have a sufficient background of information theory? Find the mutual information between these two categories.

Course Coordinator

BoS Member

BoS Chairman

Computer Organization and Microprocessors Techniques (CSUA21173)

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Tutorials : 1 Hr/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Prerequisites : Digital Systems and Basics of Computer Programming

Course Objectives

- To understand the structure, function and characteristics of computer systems
- To explain the function of each element of a memory hierarchy, identify and compare different methods for computer I/O
- To study pipelined architecture in microprocessors
- To study memory management in microprocessors
- To exolain the elements of modern instructions sets and explain their impact on processor design.
- To study microprocessor assembly language

Course Objectives

After completion of the course, student will be able to

1. Demonstrate computer architecture concepts related to design of modern processors, memories and I/O
2. Use segment descriptors and privileges level.
3. Use Pipeline Architecture.
4. Use Memory management unit
5. Use Instruction sets.
6. Write assembly language programs using 64 bit registers.

Unit I - Computer Evolution and Performance

A top level view of Computer function and interconnection- Computer Components, Computer Function, Interconnection structure, bus interconnection,

Computer Arithmetic- The Arithmetic and Logic Unit, Addition and subtraction of signed numbers, Design of adder and fast adder, Carry look ahead addition, Multiplication of positive numbers, Signed operand multiplication, Booths algorithm, Fast multiplication, Integer division.

Floating point representation and operations – IEEE standard.

Unit II - Computer Memory System and I/O System

Characteristics of memory system,Memory hierarchy.

Cache Memory- Cache memory principles, Mapping functions, Replacement algorithms, Write policy, One level and two level cache, Internal Memory, External Memory

I/O modules- Module function and I/O module structure, Programmed I/O, Interrupt driven I/O

Unit III –Processor Organization

Register organization- User visible registers, Control and Status registers,
Instruction Cycle-Indirect cycle and Data flow.
Instruction Pipelining- Pipelining Strategy, Pipeline performance, Pipeline hazards, Dealing with branches.
Fundamental Concepts- Register transfer, Performing arithmetic or logic operations, Fetching a word from memory, Storing a word in memory, Execution of a complete instruction- branch instructions.

Unit IV - Introduction to Microprocessor

Architecture of 8086 and 80386DX, Register set, Flags, Physical address space of 8086, Data types, Addressing Modes.

Unit V - Memory Management and Protection

Memory Management in 80386-Segment Translation, Page Translation, Combining Segment and Page Translation, Operating in Real Mode, Virtual x86 Mode.
Protection: Need of Protection, Overview of 80386DX protection Mechanism, Privilege levels

Unit VI - Instruction Set and Assembly Language Structure

Assembly Language Structure: Basic Syntax, Assembler, Linker, Debugger (Turbo debugger), Directives, Procedures (Near & Far), Macros, Loop constructs, Linux System Calls, 80386DX Instruction Set.
Characteristics and Functions- Machine instruction characteristics, Types of operands,
Types of operations- Data transfer, Arithmetic, Logical, Conversion, Input-output, System control and Transfer of control, String.

Text Books

1. W. Stallings, ―Computer Organization and Architecture: Designing for performance‖, Pearson Education/ Prentice Hall of India, 2003, ISBN 978-93-325-1870-4, 7th Edition**.**
2. Zaky S, Hamacher, ―Computer Organization‖, 5th Edition, McGraw-Hill Publications, 2001, ISBN-978-1-25-900537-5, 5th Edition.
3. Chris H. Pappas, William H. Murray 80386 Microprocessor Handbook
4. Douglas Hall, "Microprocessors & Interfacing", McGraw Hill, Revised 2nd Edition, 2006 ISBN 0-07-100462-9

Reference Books

1. John P Hays, ―Computer Architecture and Organization‖, McGraw-Hill Publication, 1998, ISBN:978-1-25-902856-4, 3rd Edition.
2. Intel 64 and IA-32 bit architectures Software Developer's Manual, Volume 3A, Intel, (Digital Content PDF: 253668.pdf
3. A.Ray, K.Bhurchandi, "Advanced Microprocessors and peripherals: Architecture, Programming & Interfacing", Tata McGraw Hill,2004 ISBN 0-07-463841-6

List of Tutorials
Group A (All mandatory)
1) Multiply the following using Booth's Algorithm Multiplicand = +11 Multiplier = -6
2) Perform Division of following numbers using Restoring Division Algorithm Dividend= 1011 Divisor=0011
3) A block set associative cache consist of 64 blocks divided into 2 sets the main memory contain 4096 blocks each consisting of 128 words find bits in TAG, LINE and WORD.
4) Consider cache consisting of 16- words. Each block consists of 4 words. Size of main memory 256 bytes find Tag, Line and Word for Direct Mapping
5) Write 64-bit ALP to "Hello World" in NASM.
6) Write 64-bit ALP to accept number and display it on screen.
Group B (any 3)
1) Write 64-bit ALP to accept the numbers from user and perform addition of 2 numbers and display the result on screen.
2) Write 64-bit ALP to display factorial of number accepted from user.
3) Write 64-bit ALP to perform following string operations i) Length of String ii) Reverse of String
4) Write 64-bit ALP to convert HEX 4-digit input to BCD 5-digit output.
5) Write 64-bit ALP to perform multiplication of two 8-bit hexadecimal number with successive addition.
6) Write 64-bit ALP to display the value of GDTR, LDTR, IDTR, TR and MSW registers.

Course Coordinator

BoS Member

BoS Chairman

Fundamentals of Data Structure (CSUA21174)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Prerequisites : Basics of Computer Programming

Course Objectives

- To understand the different ways of data representation
- To develop the ability to synthesize and analyze algorithms
- To teach linear data structures
- To teach applications of linear data structures
- To understand various data searching methods with pros and cons
- To understand various data sorting methods with pros and cons

Course Outcomes

After completion of the course, student will be able to

1. Understand the different ways of data representation
2. Synthesize and analyze algorithms with respect to time and space complexity.
3. Select and use appropriate data structures for problem solving and programming
4. Use appropriate algorithmic strategy for better efficiency
5. Select appropriate searching techniques in the application development
6. Select appropriate sorting techniques in the application development

Unit I - Introduction to Data Structures

Concept of data, Data object, Data structure, Abstract Data Types (ADT), Introduction to Pointers, Dynamic memory allocation, Concept of Primitive and Non primitive, Linear and Non-linear, Static and Dynamic, Persistent and Ephemeral data structures, Recursions, Amortized Analysis.

Analysis of algorithm: Frequency count and its importance in analysis of an algorithm, Asymptotic Notation, Big O, Omega, Theta Notation.

Unit II - Concept of Sequential Organization

Concept of Linear data structures, Concept of ordered list, Storage representations of ordered list such as Row major, Column major and their address calculation. Representation of Sparse Matrix using arrays, Application of array in Polynomial Representation and algorithm for Sparse Matrix Addition, Multiplication, Simple and Fast transpose, Pointer to an arrays, Array of pointers, String Manipulation.

Unit III – Linear Data Structure- Linked Lists

Concept, Comparison of Sequential and Linked Organizations, Linked list as an ADT, Singly Linked List, Doubly Linked List and Circular Linked Lists with all operations like Creations, Insertion (all positions), Deletion (all positions), Modify, Merge and Reverse, Unrolled Linked List, Skip Lists

Unit IV - Linear Data Structures –Stack

Concept of stack, Stack as an ADT, Push and Pop operation, Stack implementation using array and linked list, Application of stack for expression conversion and evaluation, Recursion concept and use of internal stack.
Unit V - Linear Data Structures-Queue
Concept of Queue, Queue as an ADT, Linear Queue implementation using array and linked list, Circular Queue, Priority Queue, Doubly Ended Queue, Multi-Queues, Applications of Queue.
Unit VI - Searching Sorting Algorithms
Searching: Liner and Binary search, Sentinel search, Ternaryand Fibonacci search. Sorting: Bubble sort, Selection sort, Insertion Sort, Merge Sort, Quick Sort, Bucket Sort & their Complexity Analysis.
Text Books
1. Ellis Horowitz, SartajSahni, Dinesh Mehta, "Fundamentals of Data Structures in C++", Published by W. H. Freeman, ISBN 10:0716782928 ISBN 13: 9780716782926. 2. R. Gilberg, B. Forouzan, "Data Structures: A pseudo code approach with C", Cenage Learning, ISBN 9788131503140. 3. Langsam,Augenstein, Tenenbaum ,Data Structures Using C and C++, 2e, Pearson Publication
Reference Books
1. Mark Allen Weiss "Data Structures and Algorithm Analysis in C++" ISBN-13: 978-0- 13-284737-7 (alk. paper) ISBN-10: 0-13-284737-X (alk. paper) 2. John R. Hubbard, "Data structures with C++", Schaum's Publication 3. A. Aho, J. Hopcroft, J. Ulman, "Data Structures and Algorithms", Pearson Education, 1998, ISBN-0-201-43578-0 4. J. Tremblay, P. Soresan, "An introduction to data structures with Applications", 2nd edition, Tata McGraw-Hill International Editions, 1984, ISBN-0-07-462471-5.

Course Coordinator

BoS Member

BoS Chairman

Digital Systems and Logic Design (CSUA21175)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Prerequisite : Basic Electronics Engg.

Course objectives

- To learn and understand basic digital design techniques
- To learn and understand design and construction of combinational circuits
- To learn and understand design and construction of sequential circuits
- To understand concept of ASM and design and implement digital circuits using VHDL
- To understand concept of programmable logic devices
- To understand basics of Logic Families in development of mini digital circiuits

Course Outcomes

After completion of the course, student will be able to

1. Simplify boolean algebraic expressions for designing digital circuits using K-Maps.
2. Use necessary convention and design combinational circuits.
3. Use necessary convention and design ssequential circuits.
4. Design digital circuits using VHDL & ASM chart.
5. Implement PLD's in PLA and PAL.
6. Design and implement Mini digital circuits.

Unit I - Number System and Logic Minimization Techniques

Number System: Introduction, Binary number System, Sign-Magnitude representation, One's and Two's complement representation, Binary arithmetic, 2's complement arithmetic, Octal number System, Hexadecimal number System, Basic theorems and properties.
Logic minimization: Representation of truth-table, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using K-Maps up to 4 variables and Quine-McCluskey Technique, realization of logic gates.

Unit II - Combinational Logic

Design of Combinational Logic: Code converter - BCD, Excess-3, Gray code, Binary Code. Half-Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Look ahead carry generator, Multiplexers (MUX): MUX (IC 74153, 74151), MUX tree, Demultiplexers (DEMUX)-Decoder. (IC 74138, IC 74154). DMUX Tree, Implementation of SOP and POS using MUX, DMUX, Comparators, Parity generators and Checker, One bit, Two bit , 4-bit Magnitude Comparator

Unit III – Sequential Logics

Flip- flop: SR, JK, D, T; Preset & Clear, Master and Slave Flip Flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop. **Registers:** Buffer register, shift register(SISO, SIPO, PISO& PIPO), Applications of shift registers. **Counters:** Asynchronous counter. Synchronous counter, ring counters, Johnson Counter, Modulus of the counter (IC 7490). **Synchronous Sequential Circuit Design:** Models – Moore and Mealy, State diagram and State Tables, Design Procedure, Sequence generator and detector.
Unit IV - Introduction to PLD's
Introduction to PLD's: - ROM, PAL, PLA, Applications of PLAs to implement combinational and sequential logic circuits
Unit V - ASM & VHDL
ASM: Algorithmic State Machines: Finite State Machines (FSM) and ASM, ASM charts, notations, construction of ASM chart and realization for sequential circuits, **VHDL:** Introduction to HDL, Data Objects & Data Types, Attributes., VHDL- Library, Design Entity, Architecture, Modeling Styles, Concurrent and Sequential Statements.
Unit VI – Logic Families
Introduction to logic families, Classification of logic families, Basics of soldiering techniques, PCB circuit generation and mounting of electronic components. Introduction and applications of Raspberry pi and Arduino.
Text Books
1. R. P. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw-Hill, 2003, ISBN0 – 07 – 049492 – 4 2. J. Bhaskar "VHDL Primer" 3rd Edition, Pearson Edition 3. Stephen Brown, ZvonkoVranesic, ―Fundamentals of Digital Logic with VHDL Design‖, McGraw-Hill, ISBN–13:978-1-25-902597-6 4. G. K. Kharate, "Digital Electronics", Oxford Univerisity Press
Reference Books
1. John Yarbrough, "Digital Logic applications and Design" Thomson 2. Flyod "Digital Principles", Pearson Education 3. Malvino, D.Leach " Digital Principles and Applications", 5th edition, Tata Mc- Graw Hill 4. Douglas L. Perry, "VHDL Programming by Example", Tata McGraw Hill

Course Coordinator

BoS Member

BoS Chairman

Object Oriented Programming (CSUA21176)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Prerequisites : Basics of Computer programming

Course Objectives

- To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism
- To use the object-oriented paradigm in program design
- To provide programming insight using OOP constructs
- To learn syntax, features of, and how to utilize the Standard Template Library
- To lay a foundation for advanced programming

Course Outcomes

After completion of the course, student will be able to

1. Understand the concept of OOP
2. Apply concept and use of reusability
3. Develop application using concept of polymorphisms
4. Implement application using generic programming concepts
5. Perform file operations
6. Percept the utility and applicability of OOP

Unit I – Classes and Objects

Need of Object Oriented Programming, Introduction OOP, Procedural Vs. Object Oriented Programming, Principles of OOP, Benifits and applications of OOP, Program structure: namespace, identifiers, variables,constants,enum,operators,typecasting,control structures, Object Oriented Programming language, datatypes, array and string, class, object, class & data abstraction, class scope & accessing data members, controlling access to members

Unit II - Inheritance and Polymorphism

Base class, Derived class, public, private & protected keywords, Types of inheritance, Ambiguity in multiple inheritance, Classes within classes, Polymorphism concept,Types of polymorphism,function overloading, operator overloading, Unary operator overloading & Binary operator overloading

Unit III – Virtual Function

Virtual functions: Memory Management: new and delete, pointers to objects, Accessing array using pointers, function pointers, Pointers to pointers, Friend function, Static function, this pointer, Virtual function, Dynamic binding

Unit IV - Exception Handling & Templates

Fundamentals, exception handling using try-throw-catch, Standard exceptions, User defined exceptions. Generics, Generic programming, Class templates, Function templates.

Unit V - Streams and Files

Stream concept, File pointers, File I/O classes, File I/O functions, and insertion and Extraction operators in file streams
Unit VI - STL and Smart Pointers
Introduction to STL, Components of STL – Containers, Iterators and Algorithms, List, Vector, set, minmax, algorithm header files. Smart pointers concept, shared pointers concept, memory leak problem**.**
Text Books
1. Bjarne Stroustrup, ―The C++ Programming language‖, Third edition, Pearson Education. ISBN 9780201889543 2. C++ Primer, 5th Edition,Stanley B. Lippman,Josée Lajoie,Barbara E. Moo,2013 |Addison-Wesley Professional
Reference Books
1. B. Kernighan, D. Ritchie, "The C Programming Language", Prentice Hall of India 2. Robert Lafore, ―Object-Oriented Programming in C++, Fourth Edition, SAMs Publishing, ISBN:0672323087 (ISBN 13: 9780672323089) 3. Herbert Schildt, ―C++ The Complete Reference‖, Eighth Edition, McGraw Hill Professional, 2011, ISBN:978-00-72226805 4. E. Balagurusamy-- Object-Oriented Programming with C++, Fourth Edition, McGraw Hill Professional,2008, ISBN 978-0-07-066907-9

Course Coordinator

BoS Member

BoS Chairman

Lab Practice-I (CSUA21177)

Teaching Scheme
Credits : 3
Practicals : 6 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Course Objectives

- To explain the ability to synthesize and analyze algorithms
- To teach linear data structures and their applications
- To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism
- To lay a foundation for advanced programming
- To understand the functionality and design of Combinational and Sequential Circuits
- To explain the design and implement digital circuits using VHDL

Course Outcomes

After completion of the course, student will be able to

1. Synthesize and analyze algorithms with respect to time and space complexity.
2. Select and use appropriate data structures for problem solving and programming
3. Design and apply OOP principles for effective programming
4. Develop programming application using object oriented programming language C++
5. Realize and simplify Boolean Algebraic assignments for designing &implementing Sequential and Combinational digital circuits using K Maps
6. Design simple digital systems using VHDL

.

List of Assignments

	A. Fundamentals Of Data Structures
1	Represent matrix using two dimensional arrays and perform following operations without pointers: i. Addition ii. Multiplication iii.Transpose

2	Represent matrix using two dimensional arrays and perform following operations without pointers: i.Saddle Point ii.Upper and Lower triangular matrix
3	Write a menu driven program in C++ for the following operations on Singly Linked List (SLL) of student data with the fields: PRN, Name, Branch, Semester, Cell Number a. Create a SLL of N Students b. Perform Insertion c. Displaythe SLL and count the number of nodes in it
4	Write a menu driven program in C++ for the following operations on Singly Linked List (SLL) of student data with the fields: PRN, Name, Branch, Semester, Cell Number a. Create a SLL b. Search a node c. Deletion of node
5	Perform implementation of STACK using Array a. Push an element on to Stack b. Pop an element c. Demonstrate overflow situations on Stack d. Display stack Support the program with appropriate functions for each of the above operations
6	Perform implementation of STACK using Linked List a. Push an element on to Stack b. Pop an element c. Demonstrate overflow situations on Stack d. Display stack Support the program with appropriate functions for each of the above operations
7	Implement FCFS algorithm of job scheduling in operating system with the help of suitable data structure.
8	In a hospital emergency room, arrange the patients according to severity of their problem even if they have been waiting longer. Implement it with the help of suitable data structure.
9	Write C++ program to maintain club members, sort on roll numbers in ascending order.
10	Write C++ program to implement Ternary Search for suitable application
	B. **Digital Electronics and Logic Design**
1	Realize Full Adder and Subtractor using a) Basic Gates and b) Universal Gates.
2	Design and implement Code converters-Binary to Gray and BCD to Excess-3.

3	Design and Realization of BCD Adder using 4-bit Binary Adder (IC 7483).
4	Design of Ripple Counter using suitable Flip Flops
5	Design 3 bit Synchronous Up/Down Counter using MS JK Flip Flop / D Flip Flop.
6	Design and implement Sequence generator using JK flip-flop.
7	Design and implement Sequence detector using JK flip-flop.
8	Design and simulation of - Full adder using different modeling styles of VHDL.
9	Design and simulation of - MUX using different modeling styles of VHDL.
10	Design and simulation of mini project.
C. **Object Oriented Programming**	
1	Create structure for Doctors having members as Name, specialization and year of experience. Accept record of 5 different Doctors and display them using function.
2	Develop an object oriented program in C++ to create a database of student information system containing the following information: Name, Roll number, Class, division, Date of Birth, Blood group, Contact address, telephone number, driving license no. etc Construct the database with suitable member functions for initializing and destroying the data viz, constructor, default constructor, Copy constructor, destructor. Implement all the keywords as mentioned in the problem statement.
3	Develop an object oriented program in C++ to create a database of student information system containing the following information: Name, Roll number, Class, division, Date of Birth, Blood group, Contact address, telephone number, driving license no. etc Construct the database with suitable member functions viz, static member functions, friend class/ friend function, this pointer, inline code and dynamic memory allocation operators-new and delete. Implement all the keywords as mentioned in the problem statement.
4	Implement a class Complex which represents the Complex Number data type. Implement the following operations: 1. Constructor (including a default constructor which creates the complex number 0+0i). 2. Overloaded operator+ to add two complex numbers. 3. Overloaded operator* to multiply two complex numbers. 4. Overloaded << and >> to print and read Complex Numbers.
5	Create employee bio-data using following classes i) Personal record ii))Professional record iii) Academic record Assume appropriate data members and member function to accept required data & print bio-data. Create bio-data using multiple inheritance using C++.
6	Write a function template and class template selection Sort. Write a program that inputs, sorts and outputs an integer array and a float array.

7	Create User defined exception to check the following conditions and throw the exception if the criterion does not meet. a. User has age between 18 and 55 b. User stays has income between Rs. 50,000 – Rs. 1,00,000 per month Accept age, Income, from the user and check for the conditions mentioned above. If any of the condition not met then throw the exception. If user does not enter proper input throw the exception
8	Create User defined exception to check the following conditions and throw the exception if the criterion does not meet. a. User stays in Pune/ Mumbai/ Bangalore / Chennai b. User has 4-wheeler City, Vehicle from the user and check for the conditions mentioned above. If any of the condition not met then throw the exception. If user does not enter proper input throw the exception
9	Create a class template to represent a generic vector. Include following member functions: i. To create the vector. ii. To modify the value of a given element iii. To multiply by a scalar value iv. To display the vector in the form (10,20,30,…)
10	Using standard template library (STL) list container implement following member functions of list class: empty, insert, reverse, sort, Unique, using iterator.

Text Books

A.	1. Ellis Horowitz, SartajSahni, Dinesh Mehta, "Fundamentals of Data Structures in C++", Published by W. H. Freeman, ISBN 10:0716782928 ISBN 13: 9780716782926. 2. R. Gilberg, B. Forouzan, "Data Structures: A pseudo code approach with C", Cenage Learning, ISBN 9788131503140. 3. Langsam,Augenstein, Tenenbaum ,Data Structures Using C and C++, 2e, Pearson Publication
B.	1. R. P. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw-Hill, 2003, ISBN0 – 07 – 049492 – 4 2. J. Bhaskar "VHDL Primer" 3rd Edition, Pearson Edition
C.	1. Bjarne Stroustrup, ― The C++ Programming language‖, Third edition, Pearson Education. ISBN 9780201889543 2. C++ Primer, 5th Edition,Stanley B. Lippman,Josée Lajoie,Barbara E. Moo,2013 |Addison-Wesley Professional

Course Coordinator

BoS Member

BoS Chairman

Skill Development I (Data Structure using C++) (CSUA21178)

Teaching Scheme
Credits : 1
Practicals : 2 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : NA

Course Objectives

- To understand the different ways of data representation
- To develop the ability to synthesize and analyze algorithms
- To learn linear data structures and their applications
- To understand various data searching and sorting methods with pros and cons

Course Outcomes

After completion of the course, student will be able to

1. Understand the different ways of data representation
2. Synthesize and analyze algorithms with respect to time and space complexity
3. Select and use appropriate data structures for problem solving and programming
4. Use appropriate algorithmic strategy for better efficiency
5. Select appropriate searching and/or sorting techniques in the application development
6. Design and develop mini project

List of Assignments

1	Implement a menu driven Program in C++ using function for the following Array operations a. Creating an Array of N Integer Elements b. Display of Array Elements c. Display sum of array elements. d. Deleting an Element at a given valid Position(POS)
2	Implement following operations on string with pointers (without using library functions) i. Length ii. Palindrome iii. String comparison
3	Implement following operations on string with pointers (without using library functions) i. Copy ii. Reverse iii. Substring
4	Implement a menu driven Program in C++ for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: EMP-ID, Name, Dept, Designation,PhNo. a.Create a DLL of N Employees Data. b. Display the DLL c.Perform Insertion

5	Implement a menu driven Program in C++ for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: EMP-ID, Name, Dept, Designation,PhNo. a.Create a DLL of N Employees Data. b.Perform Deletion c. Display the DLL
6	Design, Develop and Implement a Program in C++ for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %,^ and alphanumeric operands.
7	Pizza parlor accepting maximum M orders. Orders are served in first come first served basis. Order once placed cannot be cancelled. Write C++ program to simulate the system using circular queue using array.
8	a) Sort the set of strings in ascending order using Bubble sort and descending order by using Selection sort (Display pass by pass output) b) Search a number using Fibonacci search.
9	Write C++ program to store names and mobile numbers of your friends in sorted order on names. a) Search your friend from list using binary search (recursive and non recursive)
10.	Develop Mini project based on above assignments.

Course Coordinator

BoS Member

BoS Chairman

Environmental Studies (CSUA21179)

Teaching Scheme
Credits: 2
Lectures: 1 Hr/week
Practical: 2 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summatve Assessment : NA

Prerequites : Basic understanding of Biology and Chemistry

Course Objectives

- To explain the importance of the environment, its components, and inter-relationship between man and environment.
- To demonstrate the importance of ecosystem, biodiversity and natural bio geo chemical cycle.
- To elucidate different types of environmental pollution and control measures.

Course Outcomes

After completion of the course, student will be able to

1. Understand and realize the multi-disciplinary nature of the environment, its components, and inter-relationship between man and environment.
2. Comprehend the importance of ecosystem, biodiversity and natural bio geo chemical cycle.
3. Identify different types of environmental pollution and control measures.

Unit I - Environment And Natural Systems

Definition and Components of Environment, Relationship between the different components of Environment, Man and Environment relationship, Impact of technology on Environment, Environmental Degradation, and Multidisciplinary nature of the Environment studies, its scope and importance in the present day Education System.

Ecology and Ecosystems:

Introduction: Ecology- Objectives and Classification , Concept of an ecosystem- structure and functions of ecosystem Components of ecosystem- Producers, Consumers, Decomposers Bio-Geo- Chemical Cycles- Hydrologic Cycle, Carbon cycle, Food Chains, Food webs ,Ecological Pyramids.

Case Study : Forest Ecosystem, Aquatic Ecosystem, Desert Ecosystem.

Unit II - Human Population And Environmental Pollution

Population Growth, World and Indian scenario, Population and Environmental Degradation, Urbanization: Urban population growth and Environmental problems

Types of Environmental Pollution:

Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution: Industrial , Agricultural, Municipal; Classification of water pollutants, Effects of water pollutants,

Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO2, Effects of common air pollutants

Land Pollution: Land uses ,Land degradation: causes, effects and control, soil erosion,

Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects,

Role of individual in the prevention of pollution. Case Study for each type of environmental pollution
Unit III - E-Waste Management And Global Environmental Issues
Electronic Waste: Definition, Amount of electronic waste worldwide, Global trade issues, Environmental impact, Information security, E-waste management, Recycling : Consumer awareness efforts, Processing techniques, Benefits of recycling,, Electronic waste substances : Hazardous and Generally non-hazardous. **Global Environmental Issues:** Climate Change, Global Warming and Green House Effect, Acid Rain, Depletion of Ozone layer.
Text Books 1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition, 2013 Publisher: Universities Press (India) Private Ltd, Hyderabad. 2. Basics of Environmental Studies by Prof Dr N S Varandani ,2013 Publisher: LAP -Lambert Academic Publishing , Germany .
Reference Books 1. Environmental Studies by Anindita Basak ,2009 Publisher: Drling Kindersley(India)Pvt. Ltd Pearson 2. Textbook of Environmental Studies by Deeksha Dave & S S Kateva , Cengage Publishers. 3. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons. 4. Environmental Studies by R. Rajagopalan, Oxford University Press 5. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by : S K Kataria & Sons New Delhi 6. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill
Practical Assignments 1. Create and demonstrate simulation model for Forest ecosystem. 2. Create and demonstrate simulation model Aquatic ecosystems 3. Create and demonstrate simulation model Desert Ecosystems 4. Create presentation for the study of causes, effects and prevention of Water Pollution. 5. Create presentation for the study of causes, effects and prevention of Air Pollution. 6. Create presentation for the study of causes, effects and prevention of Land Pollution. 7. Determine noise pollution by measuring sound using simulation tools. 8. Design and present chart explaining e-waste management. 9. Classification of electronic devices into hazardous and non hazardous devices **10.** Study of recycling using various online videos

Course Coordinator

BoS Member

BoS Chairman

Engineering Mathematics – III (CSUA22171)

Teaching Scheme
Credits : 4
Lectures : 4 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Prerequites : Engg. Math 1 & 2

Course Objectives

- To understand the method of solving algebraic, transcendental equations
- To develop the ability, to know the concepts of Engineering Mathematics
- To apply concepts of Engineering Mathematics to solve engineering problems in various fields

Course Outcomes

After completion of the course, student will be able to

1. Apply the knowledge of Linear differential Equations related to simple electrical circuits
2. Design and analysis of continuous and discrete system, where knowledge of Fourier Transform and Z Transform is required
3. Apply Advanced techniques to evaluate integrals of higher level
4. Demonstrate and understand the nature of curves like Cardioide, Astroid, Lemniscate, and Rose Curve by tracing the same using certain properties. and measure arc lengths of various curves.
5. Apply knowledge of solid geometry in various field of Engineering
6. Evaluate Double & Triple integral & apply knowledge of multiple integrals to find Area, Volume

Unit I - Linear Differential Equations

Linear Differential Equations (LDE) Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits

Unit II - Transforms

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses, Application to Wave Equation., Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit III – Statistics and Probability

Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis, Least Square approximation and Fitting of Linear and Quadratic curves. Correlation and Regression, Reliability of Regression Estimates, Theorems and Properties of Probability, , Probability Distributions: Binomial, Poisson, Normal and Hypergeometric Distribution.

Unit IV - Computer oriented Numerical Methods

Solution of Simultaneous equations by Gauss Jacobi method, Gauss Seidel method, Roots of Algebric and Transcendental equations by Bisection method, Newton -Raphson method, RegulaFalsiMetod. Solutions of Differential equations by Euler method, Euler modified method, Rungekutta 4^{th}order

method.
Unit V - Vector differential and Integral Calculus Calculus
Vector Differential Calculus: Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoid, Irrotational and Conservative Fields, Scalar Potential, Vector Identities. Vector integration: Line integral, Greens Theorem, Gauss divergence Theorem. Stokes theorem.
Unit VI - Complex Variables.
Complex Variables Functions of Complex Variables, Analytic Functions-R Equations, Conformal Mapping, Bilinear ,Transformation, Cauchy's Theorem, Cauchy's Integral formula, Laurent's Series, Residue Theorem
Text Books
1. Higher Engineering Mathematics Dr. B. S. Grewal, Khanna Publications 2. Applied Engineering Mathematics by P. N. Wartikar and J. N. Wartikar, Pune VidyarthiGrihaPrakashan.
Reference Books
1. Advanced Engineering Mathematics By Erwin Kreyszig, Wiley Publications. 2. Advanced Engineering Mathematics By O'Neil, Cengage India.

Course Coordinator

BoS Member

BoS Chairman

Mathematics Practice– III (CSUA22172)

Teaching Scheme
Credits : 1
Lectures : NIL
Tutorial : 1 Hr/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : NIL

Course Objectives

- To develop the ability, to know the concepts of Engineering Mathematics and to apply these to solve engineering problems in various fields. The Tutorial sessions and assignments will help the students to practice more problems on all the topics mentioned in the course contents.

Course Outcomes

After completion of the course, student will be able to

1. To introduce higher order linear differential equations and Modeling of problems on bending of beams, whirling of shaft and mass spring system.
2. To introduce Fourier Transform and Z Transform for Continuous and discrete time domain signals.
3. To know Statistical technique to analyse the data.
4. To introduce Numerical methods for Algorithms and programming.
5. To introduce vector differentiation and vector Integration.
6. To introduce Complex Variables and to study Analytic functions.

List of Assignments

1. Linear Differential Equations

Problems on Differential Equations by Integration method and Shortcut methods

2. Linear Differential Equations

Problems on Differential Equations by method of variations of parameter and Cauchy/Legendre Equations

3. Fourier and Z Transform

Problems on Fourier Transform

4. Fourier and Z Transform

Problems on Z Transform and Inverse Z Transform

5. Statistics and Probability

Problems on Moments, correlation, fitting of curves.

6. Statistics and Probability

Problems on Probability distributions and basic Probability.

7. Computer oriented Numerical methods

Problems on Newton Raphson method for roots of equations, Solutions of Differential equations using Runge Kutta fourth order method.

8. Vector differential Calculus
Problems on Gradient, divergence, Curl and Vector Identity.
9. Vector Integral Calculus
Problems on Line integral, surface integral, volume integral.
10. Complex variables
Problems on Analytic functions, Cauchy integral formula and bilinear transformations.
Text Books
1. Higher Engineering Mathematics Dr. B. S. Grewal, Khanna Publications 2. Applied Engineering Mathematics by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan.
Reference Books
1. Advanced Engineering Mathematics By Erwin Kreyszig, Wiley Publications. 2. Advanced Engineering Mathematics By O'Neil, Cengage India.

Course Coordinator

BoS Member

BoS Chairman

Data Structure and Files (CSUA22173)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Prerequisites : Basics of Computer Programming

Course Objectives

- To study data structures and their implementations using OOP (C++) and applications
- To study some advanced data structures such as trees, graphs, tables
- To study the representation, implementation and applications of data structures
- To choose the appropriate data structure for modeling a given problem
- To learn different file organizations

Course Outcomes

After completion of the course, student will be able to

1. Represent and implement data structures
2. Implement advanced data structures such as trees, graphs, tables
3. Represent, implement and apply various data structures
4. Choose the appropriate data structure for modeling a given problem
5. Use appropriate modern tools to understand the functionalities confined to the data structure usage
6. Use appropriate modern tools to analyze the functionalities confined to the data structure usage

Unit I – Trees

Difference in linear and non-linear data structure, Basic tree concepts, binary trees and their properties, representation using sequential and linked organization, full and complete binary trees. Conversion of general tree to binary tree. Binary tree as an ADT. Recursive and non-recursive algorithms for binary tree traversals, Binary search trees, and Binary search tree as ADT, Concept of threaded binary tree. Insertion and deletion of nodes in in-order threaded binary search tree, preorder, in-order traversals of in-order threaded binary tree, applications of binary trees: Gaming, Expression and decision trees.

Unit II - Graphs

Graph as an ADT, Representation of graphs using adjacency matrix and adjacency list, Depth First Search and Breadth First Search traversal. Prim's and Kruskal's algorithms for minimum spanning tree, shortest path using Dijkstra's algorithm, topological sorting, Applications of Graphs.

Unit III – Heaps

Heap: Heap Definition, heap properties, types of Heap, Heap data structure, Heap sort implementation, applications of heap and Heap as a priority queue

Unit IV - Symbol Tables

Symbol Table : Notion of Symbol Table, Static & dynamic tree table, concept of OBST , AVL Trees

and algorithms. **Hash tables and scattered tables:** Basic concepts, hash function, characteristics of good hash function, different key-to-address transformations techniques, synonyms or collisions, collision resolution techniques- linear probing, quadratic probing, rehashing, chaining without replacement and chaining with replacement, Applications **Merkle tree**.

Unit V - File Organization

External storage devices, Files: Definition and concepts, file organization - Sequential and random file organization, direct file organization, index sequential file organization, their implementation and comparison Multi-indexed Files, Inverted Files, Hashed Files

Unit VI - Multi way trees

Basic of m-way search tree, Red and Black trees (Insertion, Rotation and Searching),Splay tree, B trees basic operation on trees (insertion and deletion), B-tree variations , (B-Trees ,B^+Trees , B*-Trees), **Trie, PATRICIA Trie**

Text Books

1. Horowitz and Sahani, ―Fundamentals of Data Structures in C++, University Press, ISBN 10: 0716782928 ISBN 13: 9780716782926.
2. Brassard &Bratley, ―Fundamentals of Algorithmic , Prentice Hall India/Pearson Education, ISBN 13-9788120311312

Reference Books

1. R. Gillberg, B. Forouzn, ―Data Structures: A Pseudo code approach with C‖, Cenage Learning, ISBN 9788131503140.
2. Horowitz, Sahani and Rajshekaran, ―Fundamentals of Computer Algorithms‖, University Press, ISBN-13, 9788175152571
3. Introduction to Algorithms 3rd Edition by Thomas H. Cormen, Charles E.Leiserson,Ronald L Rivest,& Clifford Stein, MIT Press ,Cambridge MA USA ,ISBN 978-81-203-4007-7
4. M. Weiss, ―Data Structures and Algorithm Analysis in C++, 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0.

Course Coordinator

BoS Member

BoS Chairman

Computer Graphics (CSUA22174)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Prerequisites : Knowledge of Programming, Basic Data Structures and Mathematics

Course Objectives

- To acquaint the learner with the basic concepts of Computer Graphics
- To learn the various algorithms for generating and rendering graphical figures
- To get familiar with mathematics behind the graphical transformations
- To understand and apply various methods and techniques regarding projections, animation, shading, illumination and lighting
- To illustrate the drawing of complex objects with arbitrary camera and light sources

Course Outcomes

After completion of the course, student will be able to

1. Apply mathematics and logic to develop computer programs for elementary graphic operations.
2. Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics.
3. Learn the basic principles of 2 and 3-dimensional computer graphics.
4. Develop the competency to understand the concepts related to Computer Vision and Virtual reality.
5. Apply the logic to develop animation and gaming programs.
6. Illustrate the drawing of complex objects with arbitrary camera and light sources

Unit I - Graphics Primitives and Scan Conversion

Concepts, applications of computer graphics, pixel, frame buffer, resolution, aspect ratio.
Plotting Primitives: Scan conversions, lines, line segments, vectors, pixels and frame buffers, vector generation
Scan Conversion: Line and line segments, line drawing algorithms: Digital Differential Analyzer (DDA), Bresenhams, Line styles: thick, dotted and dashed. Circle drawing algorithm: Bresenham. Character generating methods: stroke and bitmap method.
Display Files: display file structure, algorithms and display file interpreter. Primitive operations on display file.

Unit II - Polygons and Clipping Algorithms

Introduction to Polygon, Types: Convex, Concave and Complex. Representation of polygon, Inside test, Polygon filling algorithms – Flood fill, Seed fill, Scan line fill.
Windowing and clipping: Viewing transformations, 2-D clipping: Cohen – Sutherland algorithm, Polygon clipping: Sutherland Hodgeman algorithm.

Unit III –2-D, 3-D Transformations and Projections

2-D Transformations: Introduction, Matrices, Translation, Scaling, Rotation, Homogeneous coordinates and matrix representation, Rotation about an arbitrary point, inverse and shear transformation.

3-D Transformations: Introduction, 3-D geometry, primitives, 3-D transformations and matrix representation, rotation about an arbitrary axis, 3-D viewing transformations.
Projections : Parallel (Oblique: Cavalier, Cabinet and orthographic: isometric, diametric, trimetric) and Perspective (Vanishing Points – 1 point, 2 point and 3 point)

Unit IV -Segment and Animation

Segment: Introduction, Segment table, Segment creation, closing, deleting and renaming, Visibility.
Animation: Introduction, Design of animation sequences, Animation languages, Key- frame, Morphing, Motion specification.
Colour models and applications: Properties of Light, CIE chromaticity Diagram, RGB, HSV, CMY, YIQ, colour Selection and applications.

Unit V - Shading, and Hidden Surfaces

Illumination Models: Light Sources, Ambient Light, Diffuse reflection, Specular Reflection, and the Phong model, Combined diffuse and Specular reflections with multiple light sources.
Shading Algorithms: Gauraud and Phong Shading.
Hidden Surfaces Introduction, Back face detection and removal, Algorithms: Depth buffer (z), Depth sorts (Painter), Area subdivision (Warnock), BSP tree .

Unit VI - Curves , Fractals and Graphics Tools

Curves: Introduction, Interpolation and Approximation, Blending function, B-Spline curve, Bezier curve,
Fractals: Introduction, Classification, Applications, Fractal generation: snowflake, Triadic curve, Hilbert curve.
Graphics Tools: Introduction to graphics tool: OpenGL, WebGL & usage of at least one tool of computer graphics (3D studio, Maya, Blender or Similar open source tools).

Text Books

1. S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 – 100472 – 6.
2. D. Rogers, "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0 – 07 – 047371 – 4.
3. Donald D. Hearn, ―Computer Graphics with Open GL‖, 4th Edition, ISBN-13: 9780136053583

Reference Books

1. D. Hearn, M. Baker, "Computer Graphics – C Version", 2nd Edition, Pearson Education, 2002, ISBN 81 – 7808 – 794 – 4.
2. D. Rogers, J. Adams, "Mathematical Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2002, ISBN 0 – 07 – 048677 – 8.
3. J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.

Course Coordinator

BoS Member

BoS Chairman

Fundamentals of Data Communication (CSUA22175)

Teaching Scheme
Credits : 3
Lectures : 3Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Prerequisites : Basics of Digital Systems

Course Objectives

- To understand the fundamental concepts of Data Communication.
- To learn the transmission media and tools.
- To study the functions of OSI layers and Coding techniques
- To study the modulation and demodulation techniques
- To understand functionalities of Data link layer
- To study multiple access and collision detection techniques

Course Outcomes

After completion of the course, student will be able to

1. Explain the concepts of Data Communication
2. Describe various transmission media, their connectors and to related topologies
3. Understand the functions of OSI layers & TCP/IP protocol stack
4. Explain the concept of network topologies and related network equipment
5. Study multiple access and collision detection techniques
6. Study the modulation and demodulation techniques

Unit I : Fundamentals of Signals

Analog and Digital: Analog and Digital Data, Analog and Digital Signals, Periodic and Non-periodic Signal
Periodic Analog Signals: Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals Bandwidth
Digital Signals: Bit Rate, bit Length, Digital Signal as a Composite Analog Signal, Transmission of Digital Signals
Transmission Impairment: Attenuation, Distortion, Noise
Data Rate Limits: Noiseless Channel: Nyquist Bit Rate, Noisy Channel: Shannon Capacity, Using Both Limits
Performance: Bandwidth, Throughput, Latency (delay), Bandwidth-delay Product, Jitter

Unit II : Modulation and Multiplexing Techniques

Digital-to-digital Conversion: Line Coding, Line Coding Schemes, Block Coding, Scrambling
Analog to digital Conversion: Pulse Code Modulation (PCM), Delta Modulation (DM), ADM
Transmission modes: parallel transmission, serial transmission
Analog-to-analog Conversion: Amplitude Modulation, Frequency Modulation, Phase Modulation
Multiplexing: Frequency-Division Multiplexing (FDM), Wavelength-Division Multiplexing Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing
Spread Spectrum: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum

Unit III : Transmission Media and Switching
Guided Media: Twisted-Pair, Coaxial and Fiber-Optic Cable Unguided Media: Radio Waves, Microwaves, Infrared IEEE standard and connectors for media. (RJ45, RJ11, BNC, SC/ST etc.) Circuit-switched Networks: Three Phases, Efficiency, Delay, Packet switching : Datagram networks, Virtual circuit networks Brief introduction of Digital Subscriber Line: ADSL, HDSL, SDSL, VDSL (DMT), Cable modem.
Unit IV : Layer Model and Topologies
The OSI Model: Layered Architecture, peer-to-peer Processes, Encapsulation of Layers in the OSI Model, TCP/IP Protocol Suite, LAN, MAN, WAN, Topologies like star, mesh, bus, hybrid etc. Addressing: Physical &logical Addresses, Port Addresses, Specific Addresses Connecting devices: hubs, repeaters, active hubs, bridges, layer two switches, Routers, layer three switches, gateway. Backbone networks: bus backbone, star backbone.
Unit V : Error Control and Data Link Control
Types Of Errors: Redundancy, Detection Versus Correction, Forward Error Correction Versus Retransmission Block Coding: Error Detection, Error Correction, CRC, Polynomial, Checksum, Hamming Code, Hamming Distance DLC Services: Framing, Flow and error control DLL Protocols : Simple protocol, Stop n wait, Go back to N, Selective repeat HDLC Protocol : configurations and transfer modes, frames, control field. Point-to-point Protocol (PPP) : Framing, Transition Phases, Multiplexing, Multilink PPP
Unit VI: Multiple Access and Ethernet
Random access: Aloha, Slotted Aloha, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA). Controlled access: reservation, polling, token passing. Channelization: Frequency Division Multiple Access (FDMA), Time-Division Multiple Access (TDMA), Code Division Multiple Access (CDMA). Ethernet: IEEE standards, data link layer, physical layer. Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10 gigabit Ethernet.
Text Books
1. Fourauzan B., "Data Communications and Networking", 5th edition, McGraw-Hill Publications 2. Stallings William., "Data and Computer Communications", Sixth Edition, Prentice Hall of India.
Reference Books
1. Andrew S. Tenenbaum ,"Computer Networks", Pearson 2. Douglas E. Comer, "Computer Networks and Internets", Pearson Education

Course Coordinator

BoS Member

BoS Chairman

Social Science and Engineering Economics (CSUA22176)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Prerequisites : Nil

Course Objectives

- Human and social development
- Contemporary national and international affairs
- Emergence of Indian society and Economics
- Sectoral development and Economic development and related issues (such as international economics, WTO, RBI, etc)

Course Outcomes

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

1. Understand various issues concerning human and society.
2. Realize social, cultural, economic and human issues, involved in social changes
3. Understand the nature of the individual and the relationship between the self and the community
4. Express their opinion about national health and education policies.
5. Understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.
6. Understand the fundamental concepts in engineering economics

Unit I – Indian Society

Structure of Indian Society, Indian Social Demography– Social and Cultural,
Differentiations: caste, class, gender and tribe; Institutions of marriage, family and kinship-
Secularization –Social Movements and Regionalism- Panchayatraj Institutions; Affirmative Action Programme of the Government-various reservations and commissions.

Unit II - Social Development

Scientific approach to the study of human beings. Evolution of human kind, social change and evolution. Industrial revolution. National policy on education, health and health care and human development.

Unit III –Sectoral Development

Agriculture: Technology changes, Green revolutions, Employment Rural and Urban, Government Schemes.
Industrial Development : Strategies, Public and Private Sectors, Categories, infrastructure, transport and communication, Consumer Awareness.

Unit IV – Economic Development

Need for planned economic development – Law of demand and supply. Planning objective,

five years plan, priorities and problems. Population and development. Indian Economics – basic features, natural resources population size and composition, national income concepts, micro economics of India, inflation, GDP.
Unit V – Banking and Trades
Financial Analysis, Ratios, Cost Analysis, financial Institutions, Finance Commissions, Budget Analysis. Indian Banking, Role of Reserve bank of India International Economy, WTO, International aid for economic growth.
Unit VI – Understanding Cash Flow and Taxes
Accounting for Depreciation and Income Taxes, Project Cash-Flow Analysis, Understanding Financial Statements, Case Studies – cash flow analysis done in start-up companies.
Text Books
1. Krugman, International Economics, Pearson Education. 2. Prakash, The Indian Economy, Pearson Education. 3. Thursen Gerald, Engineering Economics, Prentice Hall. 4. C.S. Rao, Environmental Pollution Control Engineering, New Age International Pvt. Ltd.
Reference Books
1. Rangarajan, Environmental Issues in India, Pearson Education. 2. University of Delhi, The Individual & Society, Pearson Education. 3. Wikipedia.org / wiki /social studies. 4. M. N. Srinivas, Social change in modern India, 1991, Orient Longman. 5. David Mandelbaum, Society in India, 1990, Popular

Course Coordinator

BoS Member

BoS Chairman

Lab Practice –II (CSUA22177)

Teaching Scheme
Credits : 3
Practicals : 6 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Course Objectives

- To build the logic to use appropriate data structure in logical and computational solutions
- To understand various algorithmic strategies to approach the problem solution
- To analyze & apply various computer graphics algorithms
- To analyze a problem statement for mini project
- To learn the transmission media and the concept of network topologies using tools
- To study error detection and correction techniques

Course Outcomes

After completion of the course, student will be able to

1. Apply appropriate advanced data structure and efficient algorithms to approach the problems of various domain
2. Apply and implement learned algorithmic strategies and data structures for problem solving
3. Implement various concepts of computer graphics algorithms
4. Implement mini project using various computer graphics algorithms
5. Understand various transmission media, their connectors and to related topologies
6. Implement various error detection and correction techniques

List of Assignments

A. Data Structures and Files

1.Construct an expression tree from postfix expression and perform recursive Inorder, Preorder and Post order traversals

2.Construct an expression tree from postfix expression and perform non-recursive Inorder and Preorder traversals

3.Construct binary search tree by inserting the values in the order given. After constructing a binary search tree
i.Insert new node

ii. Find number of nodes in longest path along with its height iii. Minimum data value found in the tree
4.Modify the above BST such that the roles of the left and right pointers are swapped at every node
5. Represent a given graph using adjacency matrix and traverse each node using Depth first search
6. Represent a given graph using adjacency list and traverse each node using Breadth first search
7. A Customer wants to travel from source A to destination B , he books a cab from source A to reach destination B calculate a shortest path by avoiding real time traffic to reach destination B
8.A node consist of <Key, Value> pair ,where nodes are compared and inserted on basis of key . Build a structure such that it should provide a facility of adding a new key ,update meaning of a key ,delete a key(linear probing without chaining)
9.Implement all the functions of a dictionary (ADT) using hashing. Data: Set of (key, value) pairs, Keys are mapped to values, Keys must be comparable, Keys must be unique Standard Operations: Insert(key, value), Find(key), Delete(key) (use linear probing with chaining)
10. A Dictionary stores keywords & its meanings. Provide facility for adding new keywords, deleting keywords, updating values of any entry. Provide facility to display whole data sorted in ascending/ Descending order. Also find how many maximum comparisons may require for finding any keyword. Use Height balance tree and find the complexity for finding a keyword
B. **Computer Graphics**
1. Write C++/JavaScript/Java program to draw line using DDA and Bresenham's algorithm 2. Write C++/JavaScript/Java program to draw circle using Bresenham's algorithm 3.Write C++/JavaScript/Java program to draw 2-D object and perform following basic transformations, a) Scaling b) Translation c) Rotation 4.Write C++/JavaScript/Java program to fill polygon using scan line algorithm 5.Write C++/JavaScript/Java program to draw a polygon and fill it with desired color using Seed fill algorithm. 6.Write C++/JavaScript/Java program to generate Hilbert curve using concept of fractals. 7.Write C++/JavaScript/Java program to generate Bouncing ball animation using Direct3D / Maya / Blender. 8 Write C++/JavaScript/Java program to simulate any one of the scene- (Mini Project) i. Airplane Landing

ii. Vehicle locomotion

9. Write C++/JavaScript/Java program to simulate any one of the scene- (Mini Project)

i. Bird Flying

ii. Any Game with locomotion.

C. **Data Communication (Any Eight)**

1. Compare and contrast OSI and TCP/IP models
2. Compare and contrast TCP and UDP protocols
3. Describe the impact of infrastructure components in an enterprise network
   - 3.a Firewalls
   - 3.b Access points
   - 3.c Wireless controllers
4. Describe the effects of cloud resources on enterprise network architecture
   - 4.a Traffic path to internal and external cloud services
   - 4.b Virtual services
   - 4.c Basic virtual network infrastructure
5. Compare and contrast collapsed core and three-tier architectures
6. Compare and contrast network topologies
   - 6.a Star
   - 6.b Mesh
   - 6.c Hybrid
7. Select the appropriate cabling type based on implementation requirements
8. Apply troubleshooting methodologies to resolve problems
   - 8.a Perform and document fault isolation
   - 8.b Resolve or escalate
   - 8.c Verify and monitor resolution
9. Configure, verify, and troubleshoot IPv4 addressing and subnetting
10. Compare and contrast IPv4 address types
    - 10.a Unicast
    - 10.b Broadcast
    - 10.c Multicast
11. Describe the need for private IPv4 addressing
12. Identify the appropriate IPv6 addressing scheme to satisfy addressing requirements in a LAN/WAN environment
13. Configure, verify, and troubleshoot IPv6 addressing
14. Configure and verify IPv6 Stateless Address Auto Configuration
15. Compare and contrast IPv6 address types
    - 15.a Global unicast
    - 15.b Unique local
    - 15.c Link local

	15.d Multicast 15.e Modified EUI 64 15.f Autoconfiguration 15.g Anycast
Text Books	
A.	1. Robert Lafore, ―Object-Oriented Programming in C++, fourth edition, Sams Publishing, ISBN:0672323087 (ISBN 13: 9780672323089) 2. Horowitz and Sahani, ―Fundamentals of Data Structures in C++, University Press, ISBN 10: 0716782928 ISBN 13: 9780716782926.
B.	1. S. Harrington, ―Computer Graphics, 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 –100472 – 6 2. D. Rogers, ―Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0 – 07 – 047371 – 4.
C.	1. Fourauzan B., "Data Communications and Networking", 5th edition, McGraw-Hill Publications 2. Stallings William., "Data and Computer Communications", Sixth Edition, Prentice Hall of India

Course Coordinator

BoS Member

BoS Chairman

Skill Development Lab II (Advanced Data Structure using C++) (CSUA22178)

Teaching Scheme
Credits : 1
Practicals : 2 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : NA

Course Objectives

- To study data structures and their implementations using OOP (C++) and applications
- To study some advanced data structures such as trees, graphs, tables
- To study the representation, implementation and applications of data structures
- To choose the appropriate data structure for modeling a given problem
- To learn different file organizations

Course Outcomes

After completion of the course, student will be able to

1. Represent and implement data structures
2. Implement advanced data structures such as trees, graphs, tables
3. Represent, implement and apply various data structures
4. Choose the appropriate data structure for modeling a given problem
5. Use appropriate modern tools to understand and analyze the functionalities confined to the data structure usage

List of assignments

1. To create ADT that implement the "set" concept. a. Add (newElement) -Place a value into the set b. Remove (element) c. Contains (element) Return true if element is in collection d. Size () Return number of values in collection e. Intersection of two sets f. Union of two sets g. Difference between two sets h.Subset
2. Construct a threaded binary search tree by inserting values in the given order and traverse it in inorder traversal using threads.
3. There are flight paths between cities. If there is a flight between city A and city B then there is an edge between the cities. The cost of the edge can be the time that flight takes to reach city B from A, or the amount of fuel used for the journey. Represent this as a graph. The node can be represented by airport name or name of the city. Use adjacency list representation of the graph or use adjacency matrix representation of the graph. Justify the storage representations used.
4. For a weighted graph G, find the minimum spanning tree using Prims algorithm
5. You have a business with several offices; you want to lease phone lines to connect them up with each other; and the phone company charges different amounts of money to connect different pairs of cities. You want a set of lines that connects all your offices with a minimum total cost. Solve the problem by suggesting appropriate data structures
6. Read the marks obtained by students of second year in an online examination of particular subject. Find out maximum and minimum marks obtained in that subject using heap data structure.
7. Insert the keys into a hash table of length m using open addressing using double hashing with h(k)=1+(k mod(m-1)).
8. Department maintains a student information. The file contains roll number, name, division and address. Allow user to add, delete information of student. Display information of particular employee. If record of student does not exist an appropriate message is displayed. If it is, then the system displays the student

details. Use sequential file to main the data.

9. Company maintains employee information as employee ID, name, designation and salary. Allow user to add, delete information of employee. Display information of particular employee. If employee does not exist an appropriate message is displayed. If it is, then the system displays the employee details. Use index sequential file to maintain the data.

10. Based on above understanding, students should develop a mini demonstrtating use of advanced data structures and slgorithmic strategies

Text Books

1. Horowitz and Sahani, ―Fundamentals of Data Structures in C++, University Press, ISBN 10: 0716782928 ISBN 13: 9780716782926.
2. Brassard &Bratley, ―Fundamentals of Algorithmic , Prentice Hall India/Pearson Education, ISBN 13-9788120311312
3. R. Gillberg, B. Forouzn, ―Data Structures: A Pseudo code approach with C‖, Cenage Learning, ISBN 9788131503140.
4. Horowitz, Sahani and Rajshekaran, ―Fundamentals of Computer Algorithms‖, University Press, ISBN-13, 9788175152571
5. Introduction to Algorithms 3rd Edition by Thomas H. Cormen, Charles E.Leiserson,Ronald L Rivest,& Clifford Stein, MIT Press ,Cambridge MA USA ,ISBN 978-81-203-4007-7
6. M. Weiss, ―Data Structures and Algorithm Analysis in C++, 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0.

Course Coordinator

BoS Member

BoS Chairman

Project Management (CSUA22179)

Teaching Scheme
Credits : 2
Lectures : 2 Hrs/week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment : NA

Prerequisite : Nil

Course Objectives

- To gain the knowledge about principles of project management
- To apply Project Management Life Cycle
- To understand the project cost estimation and project scheduling and monitoring
- To learn S/W project development and expand on the tools, techniques, and benefits of using a standard project management methodology

Course Outcomes

After completion of the course, student will be able to

1. Understand the Basic Project Management Concept
2. Understand organizational structure and initiation of project
3. Analyze and Understand the Project Cost Estimation
4. Understand project planning and scheduling of project

Unit I - Project Management Concepts

Project Management Concepts Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems & procedures for implementation. Project direction.

Unit II - Project Organization & Project Contracts

Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors

Unit III –Project Cost Estimation

Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis.The COCOMO II Model

Unit IV -Project Planning & Scheduling

Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities,

expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks
Text Books
1. Project Management by Harvey Maylor, Pearson India 2. Project Management by Choudhury, McGraw Hill 3. Project Management: A Systems Approach to Planning, Scheduling and Controlling, by Kerzner, Willey
Reference Books
1. Project Management: A Life Cycle Approach by Kanda, PHI, India 2. Ian Sommerville " Software Engineering" 9th edition Pearson Education

Course Coordinator

BoS Member

BoS Chairman