

SEMESTER-I

HCT1.1: COMPUTER ORGANIZATIONS AND ARCHITECTURE

Total Hours: 48

Unit-I

Number Systems: Binary, Octal Hexadecimal, Number Base Conversion, Addition, Subtraction Of Binary Numbers, One's And Two's Complements, Positive And Negative Numbers, Character Codes ASCH. EBCDIC.

Boolean Algebra And Logic Gates: Axiomatic Definition Of Boolean Algebra, Basic Theorems And Properties, Boolean Functions, Canonical And Standard Forms, Logic Functions Using Gates And Design Of Combinational Circuits.

Unit-II

Simplification Of Boolean Functions: Karnaugh Maps, Product of Sums, Sum of Products, Simplification, NAND and NOR Implementation, Don't Care Condition. Combinational and Sequential Logic: Adders, Subtractors, Code, Converters, Decoder Multiplexer. Flip-Flops, Shift Registers, Counters.

Unit-III

Processor Logic Design: Processor Organization, Arithmetic Logic Unit, Design of Arithmetic And Logic Circuits, Design Of Arithmetic Logic Unit, Status Registers, Design of Shifter, Processor Unit, Design Of Accumulator.

Control Logic Design: Processor Organization, Hardware Control Micro Program Control. Control of Processor Unit. Pla Control, Micro Program Sequencer, Computer Design.

Unit- IV

Micro-Computer System Design: Microcomputer Organization, Microprocessor Organization. Instructions And Addressing Modes, Subroutines and Interrupts, Memory Organization, Input- Output Interface, Programmed Input-Output, Input-Output Processor, Input-Output Device Characteristics, Direct Memory Access (Dma).

Unit-V

Memory Organization: Serial Access, Random Access Memories (RAM), Read Only Memories (ROM), Virtual Memory, Cache Memory.

Introduction To 8085 Assembly Language Programming: The 8085 Programming Model. Instruction Classification. Instruction Formal. How To Write, Assemble and Execute A Simple Program. Overview Of The 8085 Instruction Set.

References:

1. Digital Logic and Computer Design, Morris Mano, PHI
2. Digital Computer Fundamentals, Bartee, T.C., MC Graw Hill
3. Computer Architecture and Organization, Tanenbaum A.S., McGraw Hill
4. Computer Architecture and Organization, hayes, J.P., McGraw Hill
5. Introduction to Microprocessors, Gaonkar, Tata McGraw Hill
6. Digital Computer Electronics Malvino & Brown Shird Education, TMH

Neelkhat
12/10/2025

HCT1.2: DATA STRUCTURE USING C

Total Hours: 48

Unit-I

Introduction To Data Structures

08Hrs

Basic Concepts: Introduction To Data Structures, Classification of Data Structures, Partitions On Data Structures: Searching Techniques: Linear Search and Binary Search; Sorting Techniques: Bubble Sort, Selection Sort. Insertion Sort and Comparison of Sorting Techniques.

Unit-II

Linear Data Structures

10 Hrs

Stacks: Primitive Operations, Implementation of Stacks Using Arrays. Applications of Stacks, Arithmetic Expression-Conversion and Evaluation; **Queues:** Primitive Operations; Implementation of Queues. Using Arrays. Applications of Linear Queue, Circular Queue and Double Ended Queue (Deque).

Unit-III

Linked Lists

12 Hrs

Linked Lists: Introduction, Singly Linked List, Representation of A Linked List In Memory, Types of Linked Lists: Single Linked Lists Circular Linked Lists, Doubly Linked Lists; Operations On 4 Single Linked List; Applications of Linked Lists: Polynomial Representation and Sparse Matrix Manipulation.

Unit-IV

Nonlinear Data Structures

10 Hrs

Trees: Basic Concept, Binary Tree, Binary Tree Representation, Array and Linked Representations. Binary Tree Traversal, Binary Tree Variants, Application of Trees; **Graphs:** Basic Concept, Graph Terminology, Graph Implementation, Graph Traversals. Application of Graphs, Priority Queues.

Unit-V

08Hrs

Binary Search Tree and Hashing

Binary Search Trees, Properties and Operations; Balanced Search Trees: AVL Trees; Introduction To M-Way Search Trees, B Trees: Hashing and Collision: Introduction, Hash Tables, Hash Functions, Collisions, Applications of Hashing.

References:

1. S.Lipschuts. "Structures". Tata McGraw Hill Education. 1st Edition.2018
2. D.Samanta, "Classic Data Structures". PHI Learning, 2nd Edition, 2004.

Web References:

1. <https://www.tutorialpoint.com/data-structures-algorithms/algorithms-basics.htm>
2. <https://www.codocheleonVccertinc.ationidata-structuresand-algorithms/prepare>
3. <https://www.cs.attclj:Ind.-Ic.c:7/-,,11\v',rc/AlgAnim/dsToC..html>
4. <https://online-learning.htrvard.edti/cotirse/data-structures-and-algoritluns>

HCT1.3: THEORY OF COMPUTATION

Total Hours: 48

Unit-I

10Hrs

Introduction To Finite Automata: Introduction To Finite Automata, The Central Concepts of Automata Theory. Deterministic Finite Automata. Non-Deterministic Finite Automata, An Application. Finite With Epsilon-Transitions.

Unit-II

10 Hrs

Regular Expressions and Languages. Properties of Regular Languages: Regular Expression, Finite Automata and Regular Expressions. Applications of Regular Expressions, Proving Languages Run To Be Regular. Closure Properties of Regular Languages, Decision Properties of Regular Languages. Equivalence and Minimization of Automata.

Unit-III

10 Hrs

Context-Free Grammars and Languages: Context-Free Grammars. Parse Trees, Applications, Ambiguity In Grammars and Languages.

Pushdown Automata: Definition of The Pushdown Automata, The Languages of A Pda, Equivalence Of Pda's And Cfg's. Deterministic Pushdown Automata.

Unit -IV

10Hrs

Properties Of Context-Free Languages: Normal Forms For Cfgs, The Pumping Lemma For Cfgs. Closure Properties Of Cfls.

Introduction To Turing Machines: Problems That Computers Cannot Solve. The Turing Machine, Programming Techniques For Turing Machines, Extensions To The Basic Turing Machine, Restricted Turing, Machines, Turing Machine And Computers.

Unit- V

08 Hrs

Up Decidability: A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE. Post's Correspondence Problem. Other Undecidable Problems.

References:

1. J.P. Hopcroft, Rajeev Motwani. J.D. Ullman, Introduction To Automata Theory, ' Languages and Computation. II Edition. Pearson Education, 2001.
2. Introduction To Formal Languages and Automata, Peter Linz, Narosa Publ.
3. Languages & Machine An Introduction To Computer Science, Thomas A Sud Kamp, Addison Wesley.
4. Elements Of Theory Of Computation, H.R. Lewis, Shistor H, Papadimitroce, Prentice Hall, New Delhi 199
5. Introduction To Language and Theory Of Computation, John Mastin TMH New Delhi, 1998.
6. Theory Of Computation, Rajesh K Shukla, Cengage 1 Delmar Learning India Pvt, 1, 2009

HCT1.4: PROBABILITY AND STATISTICS

Total Hours : 48

Unit I:

8hrs

Probability:- Sample Space and Events – Probability. The Axioms of Probability. Some Elementary Theorems. Conditional Probability. Baye's Theorem – Random Variables – Discrete and Continuous Probability Distributions.

Unit-II

10hrs

Distributions Binomial. Poisson and Normal Distributions. Related Properties. Sampling Distributions — Sampling Distribution Of Means.

UNITIII:

8hrs

Estimation Point Estimation - Interval Estimation — Introduction To Students
T-Distribution -*Confidence* Interval For Single Mean and Single Proportion (Large and Small Samples)

Unit:IV

14hrs

Testing Of Hypothesis-I : Testing of Hypothesis-Introduction- Null Hypothesis- Alternative Hypothesis- Type I and Type II Errors — Critical Region. Test of Hypotheses For Single Mean
(Large and Small Samples) - Test of Hypotheses For Single Proportion (Large and Samples)

Testing Of Hypothesis-II: Tests of Hypotheses For Difference of Means (Large And Small Samples) - Tests of Hypotheses *For* Difference of Proportions (Large Samples) — Introduction To Chi-Square Distribution And Goodness of Fit.

Unit V:

8hrs

Correlation & Regression: Coefficient of Correlation- Regression Coefficient- The Lines Regression- The Rank Correlation.

References

1. Probability & Statistics. T.K.V.Iyengar, B. Krishna Gandhi Others 3ed. S.Chand Co, 2011
2. Probability & Statistics, D. K. Murugesan. P. Guru Swam, Led. Anuradlia Publications, 2011
3. Probability & Statistics For Engineers, G.S.S. Bhishma Rao. 2ed, Scitech Publications. 2005
4. A First Course In Probability & Statistics, B.L.S.Prakasa Rao, Led. World Scientific, 2010
5. Fundamentals of Mathematical Statistics. S.C. Gupta, V.K.Kapoor, 1 I Ed. S.Chand Co., 2003
6. Probability & Statistics For Engineers. Miller. John E. Freund, Sed, Prentice Hall Of India. 2010

SCT 1.1(a): Introduction to Algorithms

Total Hours : 48

Unit-I:

10 hrs

Introduction To Computer Problem Solving

Introduction, The Problem-Solving Aspect, Top- Down Design, Implementation of Algorithms, Program Verification, The Efficiency of Algorithms, The Analysis of Algorithms.

Fundamental Algorithms

Introduction, Exchange of Values of Two Variables, Counting, Summation of A Set of Numbers, Factorial Computation, Sine Function Computation, Generation of The Fibonacci Sequence, Reversing The Digits of An Integer, Base Conversion, Character To Number Conversion

Unit-II:

10hrs

Factoring Methods

Introduction, Finding The Square Root of A Number, The Smallest Division of An Integer, The Greatest Common Divisor of Two Integers, Generating Prime Numbers, Computing The Prime Factors of An Integer, Generation of Pseudo-Random Numbers, Raising A Number To A Large Power. Computing The Nth Fibonacci Number

Unit-III:

10hrs

Array Techniques

Introduction, Array Order Reversal, Array Counting Or Histogram Ming, Finding The Maximum Number In A Set, Removal of Duplicates From An Ordered Array, Partitioning An Array, Finding The Kth Smallest Element, Longest Monotone Subsequence.

Unit-IV:

10hrs

Merging, Sorting And Searching

Introduction, The Two-Way Merge, Sorting By Selection, Sorting By Exchange, Sorting By Insertion, Sorting By Diminishing Increment, Sorting By Partitioning, Binary Search.

Dynamic Data Structure Algorithms

8hrs

Introduction, Stack Operations, Queue Addition and Deletion, Linked List Search, Linked List Insertion and Deletion. Binary Tree Search, Binary Tree Insertion And Deletion.

Recursive Algorithms

Introduction, Binary Tree Traversal. Recursive Quick Sort, Towers of Hanoi Problem, Sample Generation. Combination Generation, Permutation Generation.

Reference:

1. How To Solve It By Computer By R. G. Dromey, Fifteenth Ed 2014
2. Algorithms And Data Structures: N. Wirth 1985 Oberon Version: August 2004.
3. Algorithmic Graph Theory By Alan Gibbons, Cambridge University Press.
4. Introduction To Algorithms, By T. Cormen , C. Leiserson , R. Rivest , C Stein, 3Ed. International Edition, MIT Press.2009.
5. Graph Theory : Modeling. Applications And Algorithms By Geir Agnarsson, Edition.200S.

