CP5151 DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

OBJECTIVES:

- To extend the students' knowledge of algorithms and data structures.
- To enhance their expertise in algorithmic analysis and algorithm design techniques.
- To understand various types of search and heap structures.
- To study various types of geometric, randomized and approximation algorithms.
- To extrapolate from them in order to apply those algorithms and techniques to solve problems.

UNIT I FUNDAMENTALS 9

Properties of Big-oh Notation –Conditional Asymptotic Notation – Algorithm Analysis – Amortized Analysis – Introduction to NP-Completeness/NP-Hard – Recurrence Equations – Solving Recurrence Equations – Time-Space Tradeoff.

UNIT II SEARCH STRUCTURES 9

Binary Search Trees – AVL Trees – Red-Black trees – Multi-way Search Trees –B-Trees – Splay Trees – Tries.

UNIT III HEAP STRUCTURES 9

Min/Max heaps – Deaps – Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps – Lazy Binomial Heaps

UNIT IV GEOMETRIC ALGORITHMS 9

Segment Trees – 1-Dimensional Range Searching – k-d Trees – Line Segment Intersection – Computing the Overlay of Two Subdivisions – Range Trees – Voronoi Diagram

UNIT V ADDITIONAL TOPICS 9

Approximation Algorithms: Vertex Cover & Euclidean Travelling Salesperson Problem – Randomized Algorithms: Closest Pair Problem & Minimum Spanning Trees – Online Algorithm: Euclidean Spanning Tree.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student will be able to

- Analyze algorithms.
- Determine algorithm correctness.
- Choose appropriate data structures for the problems to be solved.
- Design algorithms for problems from different domains.
- Identify various research strategies on algorithmic design.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C",Second Edition, University Press, 2008.
2. Gilles Brassard, Paul Bratley, "Algorithmics: Theory and Practice", Prentice Hall, 1988.
3. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, "Computational Geometry Algorithms and Applications", Third Edition, Springer, 2008.
4. R.C.T Lee, S.S Tseng, R.C Chang and Y.T Tsai, "Introduction to the Design and Analysis of Algorithms", Tata McGraw-Hill Edition, 2012.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", MIT Press, 2009.

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CP5152 **MULTICORE ARCHITECTURES** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters.
- To understand the different multiprocessor issues.
- To expose the different types of multicore architectures.
- To understand the design of the memory hierarchy.
- To understand how the various forms of parallelism are exploited by the architecture.

UNIT I FUNDAMENTALS OF COMPUTER DESIGN AND ILP **9**

Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges – Limitations of ILP – Multithreading – SMT and CMP Architectures – The Multicore era.

UNIT II MEMORY HIERARCHY DESIGN **9**

Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies – Case Studies.

UNIT III MULTIPROCESSOR ISSUES **9**

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues – Performance Issues – Synchronization Issues – Models of Memory Consistency – Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

UNIT IV MULTICORE ARCHITECTURES **9**

Homogeneous and Heterogeneous Multi-core Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture. Introduction to Warehouse-Scale computers, Cloud Computing – Architectures and Issues – Case Studies.

UNIT V VECTOR, SIMD AND GPU ARCHITECTURES **9**

Vector Architecture – SIMD Extensions for Multimedia – Graphics Processing Units – Case Studies – GPGPU Computing – Detecting and Enhancing Loop Level Parallelism – Introduction to Domain Specific Architectures.

TOTAL : 45 PERIODS