MASSIVE PARALLEL PROCESSING - CS501

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

Overview of modern processor architectures. Memory Hierarchy


Types of parallel machine


Replicated Architectures: SIMD/MIMD

Shared Memory and Distributed Memory

RISC, CISC Scalar processors, super Scalar and VLIW Computers

Multi-vector Computers

Connectivity Interconnection networks: topology, routing, flow control, deadlock avoidance, static and dynamic interconnection networks.

Virtual channels, wormhole routing and vertical cut-through.

1. Program and Network Properties
2. Conditions of parallelism
3. Program Partitioning and Scheduling
4. Program flow mechanisms
5. Principles of Scalable Performance
6. Performance Metrics and Measures
7. Parallel processing Applications
8. Speedup Performance laws

References

DISTRIBUTED COMPUTING - CS502

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1


Communication: Layered protocols, Client server protocols, RPC, group communication.

Coordination, synchronization & consistency: Logical clocks, Physical clocks, mutual exclusion, election algorithms, atomic broadcast, sequential consistency transaction distributed consensus, Threads: Thread synchronization, implementation issues, and threads vs. RPC.

Models of distributed computing: Client server and RPC, RPC architecture, exceptions, underlying protocols, IDL, marshalling etc.

Group models and peer to peer: Groups for service replication/ reliability, groups for parallelism / performance, client/ server vs. peer-to-peer, multicast, atomic broadcast.

Distributed file system: Security, Naming/ location transparency, R/W semantics, cache coherence, replication. Distributed shared memory: DSM architecture, consistency models and relation to caching, release consistency, comparison with message passing and RPC.
Fault tolerant distributed systems: Introduction, dependability, faults vs. errors vs. failure, space time and value redundancy, fault tolerant architecture, failure detection algorithms, partitioning, FT consensus.

Distributed multimedia system: Introduction, characteristics, and resource management stream adaptation.

Security: Introduction, security techniques, cryptographic algorithms, authentication and access control.

Case study: CORBA, MACH

References:

1) Distributed systems, concepts and design, 3rd Edition, Addison Wesley by George Colouris, Jean Dollimore and Tim Kindberg.


ADVANCED DATA STRUCTURES - CS503

Contact Hours - Lectures - 3, Tutorial – 1


Binary heaps, heap operations, specifications, implementation and applications. Advanced heap structures – d-heaps, leftist heaps, Skew heaps, Priority queue operations and Double-ended priority queues.

Amortized analysis, Splay trees, Binomial heaps, Fibonacci heaps. Dictionaries, Data structures for disjoint sets, tables and table operations.

Data Structures for External Memory. External sorting, Disjoint Set, String matching.

Randomized Data structures and algorithms: - Skip lists, Treaps, Tries, Convex Hull Problem, Max Flow and Min cut graph algorithm, Markov chain and Random walks.
ADVANCED SOFTWARE ENGINEERING - CS504

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

This is a Research oriented, seminar type course, which will focus on the state-of-the-art in various areas of Software Engineering –

Software Project Management, Metrics and measurement, Software Configuration management, Software risk management, Requirements Engineering, Software quality assurance, software reliability models.

Object oriented design, object oriented programming (with C++), Formal specifications, Formal verification of programs, Jackson method for design, CASE tools and technology, Clean room method for software development, Information system design, Real-time software specification and design.

Role of architecture in software engineering: Enterprise architectures, Zachman’s Framework, Architectural styles, Design Patterns,

Architecture Description Languages, Product-Line architectures, Component Based Development.

References:


4. Ghazzi, Frank Buschmann, Regine Meunier Hans Rohnert, PeterSommerland, Miachel Stal, Doughlas Schmidt Pattern Oriented Software Architecture, Volumes 1 & 2


**APPLIED INFORMATION THEORY AND CODING CS505**

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial – 1

Information Theory: Marginal, joint and conditional entropy, information rate, mutual information, channel capacity of various channels, cascaded channels, repetition of signals

Shannon’s theorem: Shannon Hartley theorem, bandwidth- S/N ratio tradeoff, continuous channel, negative entropy

Coding: irreducibility, separability, coding efficiency, source encoding, Shannon Fano code, Huffman code, and data compression

Channel Encoding: minimum distance, error detection and correction, FEC and ARQ, block code, convolution codes, and cyclic codes, signal error correction, multiple error correction, burst error correction, Cryptography, Encryption and decryption

References:

1. Information Theory; F.M Reza; McGraw Hills
2. Digital and Analog Communication Systems; K Sam Shanmugam; John Wiley
3. Communication Systems: Analog and digital; Singh and Sapre; TMH 1995
4. Digital Communication; B. Sklar; Pearson Education Asia
ANALYSIS AND DESIGN OF EMBEDDED SYSTEMS CS551

Theory -

Sessional –

Contact Hours - Lectures - 3, Tutorial - 1

Embedded systems and their characteristics, challenges and issues in embedded software development, Hardware and electronics fundamentals for software engineers, categories of different processor microprocessor and micro controller,

Study of 8051 micro controllers, assembly language programming, and instruction sets addressing modes, I/O ports programming.

Study of embedded processors and systems like PIC, AVR, micro controller, 68000, series computer, DSP based controller,

Peripherals and interfacing: Adding peripherals using SPI and I2 serial peripherals, serial ports, networks, memory, bus interfaces, power considerations

Operating system services: different categories of operating system, kernel architecture, and root file system contents, storage device manipulations, setting up boot loader

Development tools, preliminary programming, determining the requirement, design the system architecture, system integration, commissioning the system, Hardware software co-design, and case studies in different embedded systems.

ADVANCES IN COMPUTER NETWORK AND DATA SECURITY CS552

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

Review of networking concepts: Network models, Addressing, Data rate limits, Bandwidth, throughput, Latency

Multiple Access: Random Access, Aloha, CSMA, CSMA/CD, CSMA/CS, Controlled Access, Reservation, Polling, Token Passing, FDMA, TDMA, CDMA
Standard Ethernet, Fast Ethernet and Gigabit Ethernet, SONET, ATM, QoS in ATM, ATM applications

Residential broadband (High speed access to home): ADSL, Cable modems, Hybrid- Fiber Coax IPv4, IPv6, IP Security, Virtual Private Networks

Multimedia Networks: Voice/Video over IP, IP Telephony, Voice over ATM, AAL2

Quality of Service in Data Networks, Wavelength division multiplexing (WDM) Optical DWDM Networks, IP over DWDM


ADVANCE ALGORITHMS DESIGN & ANALYSIS - CS553

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

Unit 1: Introduction: - Computational Demands of Modern Science, Advent of Practical Parallel Processing, Parallel Processing Terminology.

Unit 2 and 3: PRAM Algorithms: - A model of Serial Computation, Pram model of Parallel Computation, Pram Algorithms, Parallel Reduction, Prefix Sums, list Ranking, Preorder Tree Traversal, Merging Two Sorted Lists, Graph Coloring.

Unit 4: Sorting: - Enumeration Sort, Lower Bounds on Parallel Sorting, Odd Even Transposition Sort, Bitonic Merge Sort, Parallel Quick Sort.

Unit 5: Graph Algorithms: - Searching a Graph, Breadth First Search, Breadth Depth Search, Connected Components; All Pairs Shortest Paths, Minimum Cost Spanning Tree.

Unit 6: Processor Organizations: - Mesh Networks, Binary Tree Networks, Hyper Cube Networks, Butterfly Networks, Hyper Tree Networks, Cube Connected Cycles, Shuffle Exchange Networks, de Bruijn Networks.

References: Parallel Algorithms by Joseph Jaja.

Algorithms by Coremen

Quantum Computation by Neilson & Chung
Introduction to distributed databases, comparison of distributed and centralized systems, DDBMS, global relations, fragment and physical image, types of schemas, methods of fragmentation of a relation, levels of transparency in a distributed system, integrity constraints.

Representation of database operation in form of a query, operation in form of a query, operations on a query, unary and binary tree in a query, converting a global query into fragment query, join and union operations involving a query, aggregate functions, and parametric queries.

Introduction to query optimization, estimation of profiles of algebraic operations, optimization graphs, reduction of relation using semi-join and join operation.

Properties and goals of transaction management, distributed transactions, recovery mechanism in case of transaction failures, log based recovery, check pointing, and communication and site failures in case of a transaction and methods to handle them, serializability and timestamp in distributed databases.

Introduction to distributed deadlocks, local and global wait for graphs, deadlock detection using centralized and hierarchical controllers, prevention of deadlocks, 2 and 3 phase locking and commitment protocols, reliability in commitment and locking protocols, reliability and concurrency control, reliability and removal of inconsistency.

Distributed database administration, authorization and protection in distributed databases, distributed database design, heterogeneous database system.

References:


Elective I
COMBINATORICS CS511

Theory -

Sessional –

Contact Hours - Lectures - 3, Tutorial - 1

Unit I:-

Course overview, general principles of enumeration, counting of words & subsets, binomial theorem, multiset/compositions, Lattice paths, basic identities, extended binomial coefficient, summing polynomials, Delannoy numbers, Counting graphs and trees, multinomial coefficients (trees by degrees, Fermat's Little Theorem),

Unit II:-

Generating function manipulations (differentiation, evaluation at special values, shifting index, summing initial coefficients), summation by convolutions, Snake Oil method. Exponential generating functions. Products of EGFs (words), examples and applications of EGFs (flags on poles, restricted words, Stirling numbers, binomial inversion, derangements). The Exponential Formula (graphs, partitions, permutations, recurrence), Lagrange Inversion Formula (statement and application to trees), partitions of integers (basic generating functions). Asymptotic number of partitions, Combinatorics of partitions (Ferrers diagrams, conjugation, Fallon's Identity, classes of triangles, Euler's Identity).

Unit III:-

Bipartite Matching (Hall's Theorem, Marriage Theorem, Birkhoff-von Neumann Theorem, transveral with "large" minimum (ranchers/farmers)), Min/max relations (Ore's defect formula, Konig-Egervary Theorem, Gallai's Theorem, Konig's Other Theorem), General Matching (Augmenting paths, Tutte's 1-Factor Condition, start Berge-Tutte Formula).

Unit IV:-

Connectivity under cartesian product, edge-connectivity definitions, Whitney's Theorem, edge-connectivity for diameter 2 (Plesnik), ....bonds and blocks skipped. k-Connected Graphs (Independent x,y-paths, linkage and blocking sets, Pym's Theorem, Menger's Theorems (8 versions), Ford-Fulkerson CSDR (postponed), Expansion and Fan Lemmas, cycles through specified vertices), ear decomposition and Robbins' Theorem.

Unit V:-

Vertex coloring: examples, easy bounds, greedy coloring, degree bounds, Minty's Theorem, interval graphs. Planar graphs and their duals, cycles vs bonds, bipartite plane graphs, Euler's
Formula and edge bound. Coloring of planar graphs (5-colorability, 5-choosability, Kempe), discharging (approach to 4CT, list edge-coloring of planar graphs), (skipped Tait's Theorem, Grinberg's Theorem).

References:

1. Anderson, Combinatorics of Finite Sets
2. Brualdi, Introductory Combinatorics
3. Cameron, Combinatorics: Topics, Techniques, Algorithms

DATA WAREHOUSING AND MINING - CS512

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

Data warehousing: Introduction, scope, practical implications, structures and Functions,
Types of data warehouses: Host based, single stage, LAN based, multistage, stationary, distributed and virtual data warehouses.

Data warehouse architectures: Metadata, operational data & operational databases.

Data warehouse architecture model, 2-tier, 3tier & 4 tier data warehouses.

OLAP and DSS support in data warehouses.

Data Mining: Basic concept, technology and rules, platform tools, operational vs. Information systems, discussion of ethics & privacy issues with respect to invasive use.

Data mining techniques: Exploration of data mining methodologies, decision tables, Decision trees, classification rules, association rules, clustering, statistical models & linear models.

Advanced methods in data mining: Text data mining, text classification, naïve bayes, EM algorithm, optimization, visualization, genetic algorithms, data augmentation, Knowledge extraction.

Web mining: Introduction to web mining techniques, web basics and HTTP, data Sources on the web, personalization, working with logs, forms and cookies, user identification and path analysis. E-Metrics.
References:

1) Building the data warehouse by W.H Inmon, John Wiley & Sons.
2) Data mining concepts and techniques by Jimali Han and Micheline Kamber.
3) Data warehousing in the real world by Sam Anhory and Dennis Murray.

COMPUTATIONAL INTELLIGENCE & SOFT COMPUTING CS513

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

Introduction to neural networks, working of an artificial neuron, linear seperability, perceptron, perceptron training algorithm, back propagation algorithm, adalines and madalines.

Supervised and unsupervised learning, counter-propagation networks, adoptive resonance theory, neocognitron and bidirectional associative memory.

Introduction to fuzzy logic and fuzzy sets, fuzzy relations, fuzzy graphs, fuzzy arithmetic and fuzzy if-then rules.

Applications of fuzzy logic, neuro-fuzzy systems and genetic algorithm.

Introduction to probability theory, conditional probability, Baye’s theorem, random variables and expectations.

Probability distributions, various types of probability distributions like joint distributions, normal distributions etc., fuzzy logic and its relationship with probability theory.

References:

3) Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India.

Fuzzy logic, intelligence, control and information by John Yen and Reza Langari, Pearson Education.
HIGH PERFORMANCE COMPUTING CS514

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

Introduction to high performance computing: cluster, grid, meta-computing, middleware etc., examples of representative applications.

Programming models: shared memory, message passing, peer-to-peer, broker-based. Introduction to PVM and MPI.

Architecture of cluster-based systems, Issues in cluster design: performance, single-system-image, fault tolerance, manageability, programmability, load balancing, security, storage..


Shared-memory processing: Architectures (extensions of the memory hierarchy), Programming paradigms, OpenMP

Distributed-memory processing: Architectural issues (networks and interconnects), Programming paradigms, MPI (+MPI2)

Grids: Computational grids, Data grids ,Architecture of Grid systems, Grid security infrastructure. Examples of Grids: Globus etc

Performance issues and measurement: Profiling and development tools, Sustained versus peak performance, Performance libraries and packages

The productivity crisis & future directions: Development overheads, Petaflops programming, New parallel languages: UPC, Titanium, Co-Array FORTRAN

References:


OBJECT ORIENTED MODELLING, ANALYSIS AND DESIGN- CS515

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

UNIT – I

Object Orientation, OMT Methodology, Object and Class, Link and Association Generalization, Aggregation Multiple Inheritance, Packages

UNIT- II

Object Meta modeling, Metadata and Metamodels, Functional Modeling Pseudocode, Pseudocode with the Object Navigation Notation, ONN Constructs, combining ONN Constructs

UNIT-III

Analysis:-Object Model, Data Dictionary, Dynamic Model, Functional Model

UNIT-IV


UNIT- V

Detailed Design:- Object Model Transformations, Elaborating the Object Model, Elaborating the Functional Model, Evaluating the Quality of a Design Model

References

WIRELESS LAN AND MOBILE COMPUTING - CS601

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

1. Introduction:


Modern Wireless Communication Systems

2G/2.5G/3G/4G Wireless Networks and Standards, Wireless in Local loop & LMDS

Cellular Concepts

Frequency spectrum, frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, fundamentals of antennas, Equivalent circuit for antenna, Antennas as cell site, Mobile antennas, Analog Vs Digital, Spectrum regulation, Licensing methods.

2. Cellular Networks

Mobile Radio Propagation, A basic cellular system, Performance criterion, Operations of Cellular Networks, Concept of frequency reuse Channels, Co channel Interference and it's reduction factor, types of non co channel Interference, Desired C/I from normal case on omni directional antenna systems, Digital Modulation

3 Multi Access Technique & Wireless Standards

TDD, FDD, Rake receiver, CDD, Spread spectrum, (direct and frequency hopping) FDMA, TDMA, CDMA, Wireless Standards GSM, CDMA, DECT, UMTS & IMT-2000,

WAP Model and architecture, Gateway, Protocol stack, Wireless Application environment

4 Wireless LAN

IEEE 802.11 Concepts, MAC Layer, Spread Spectrum Wireless LAN, Infrared Wireless LANs, Other Physical Layer Protocol (IEEE 802.11b, IEEE 802.11a), Wireless PAN (Bluetooth), HIPERLAN, Mobile Network Layer (Mobile IP), Mobile Transport Layer (Mobile TCP), Mobile Data network (GPRS),

5 GSM Systems Overview
Architecture, Location tracking, and call setup. Security, Data Services N/W Signaling, GSM mobility management, Operations, Administration and maintenance. GSM bearer Services. SMS architecture-Protocol Hierarchy, DTE-DCE interface, Mobile prepaid phone services.

References

1) Wireless communication, T. S. Rappaport, PHI
3) Mobile Communications, J. Schiller, Pearson Education

ELECTIVE II

FAULT TOLERANT SYSTEM CS561

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1


Application: DHCP

Fault tolerance: Coding technique-fault tolerant self checking and fail safe circuits-fault tolerance in combinatorial and sequential circuits- synchronous and asynchronous fail safe circuits.

Software fault tolerance: Process pairs, Robust data structures, N version programming, Recovery blocks, Replica consistency & reintegration, Multithreaded programs Application: VAX
Network fault tolerance: Reliable communication protocols, Agreement protocols, Database commit protocols - Application: Distributed SQL server

Check pointing & Recovery - Application: Micro check pointing, IRIX Checkpoints

Experimental Evaluation: Modeling and simulation based, Fault injection based - Application: NFTAPE fault injector

Modeling for performance, dependability and performability: dependability-specific methods (fault trees, reliability block diagrams), queues, stochastic Petri nets and stochastic activity networks - Application: UltraSAN

Practical Systems for Fault Tolerance:
- Application: Ad-hoc wireless network
- Application: NASA Remote Exploration & Experimentation System

Architecture: Fault tolerant computers - general purpose commercial systems-fault tolerant multiprocessor and VLSI based communication architecture.

Fault tolerant software: Design-N-version programming recovery block - acceptance tests-fault trees- validation of fault tolerant systems.

REFERENCES

Fuzzy Systems CS562

Theory -

Sessional -
Contact Hours - Lectures - 3, Tutorial - 1

Introduction to fuzzy logic and fuzzy sets.

Fuzzy relations, fuzzy graphs, fuzzy arithmetic, fuzzy if-then rules.

Fuzzy implications and approximate reasoning, fuzzy logic and probability theory.

Fuzzy model identification, use of fuzzy logic in database and information systems.

Use of fuzzy logic in the area of artificial intelligence and Pattern recognition.

Neuro-fuzzy systems, genetic algorithm and fuzzy logic.

References


ELECTRONICS DESIGN AUTOMATION CS563

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

Introduction: digital design flow.

Verilog: introduction and use in synthesis, modeling combinational and sequential logic, writing test benches.

Logic synthesis: multilevel gate-level optimization tools, basic concepts of high-level synthesis – partitioning, scheduling, allocation and binding.

Testability issues: fault modeling and simulation, test generation, design for testability, built-in self-test. Testing SoC’s. Basic concepts of verification.

Physical design automation. Review of MOS/CMOS fabrication technology. VLSI design styles: full-custom, standard-cell, gate-array and FPGA. Physical design automation algorithms: floor-planning, placement, routing, compaction, clock and power routing, etc.

References

1. Verilog HDL, Samir Palnitkar, Pearson Education
2. Verilog HDL Synthesis, J. Bhaskar, BS Publication
3. Modern VLSI design: systems on silicon W. Wolf, Pearson Education,
4. Algorithm for VLSI Design Automation, Sabih H. Gerez, Wiley

NETWORK DESIGN & PERFORMANCE ANALYSIS CS564

Theory -

Sessional -

Contact Hours - Lectures - 3, Tutorial - 1

Requirements, planning, & choosing technology: Business requirements, technical requirement user requirements, traffic sizing characteristics time & delay consideration.

Traffic engineering and capacity planning: Throughput calculation traffic characteristics &source models, traditional traffic engineering, queued data & packet switched traffic modeling, designing for peaks, delay or latency

Network performance modeling- 0creating traffic matrix, design tools, components of design tools, types of design projects.

Technology Comparisons- Generic packet switching networks characteristics, private vs. public networking, Business aspects of packet, frame and cell switching services, High speed LAN protocols comparison, Application performance needs, Throughput, burstiness, response time and delay tolerance, selecting service provider, vendor, service levels etc.

Access Network Design- N/W design layers, Access N/W design, access n/w capacity, Backbone n/w design, Backbone segments, backbone capacity, topologies, Tuning the network, securing the network, Design for network security.

Documentation and network management- Documentation, network management, SNMP, RMON

Network Optimization- Network optimization theory: Goals of network optimization, measurements for network optimization, optimization tools, optimization techniques.
ELECTIVE III
RANDOM ALGORITHMS CS611

Unit I:

Introduction, A min-cut algorithm, Las Vegas and Monte Carlo, Binary planar partition, A probabilistic recurrence, Computational models and time complexity.

Unit II:

Markov Chains and Random Walks:A 2-sat example, Markov chains, Random Walks on graphs, Cover times, Graph connectivity.

Unit III:

Random Data Structure: The fundamental data structure problem, Treaps, skip lists, Hash tables, Hashing with $O(1)$ time.

Unit IV:

Geometric algorithms and linear programming:

Randomized incremental construction, Convex Hulls in the plane, Duality, Half space Intersection, Delanuay triangulation, Trapeziodal decomposition, Binary Space partition, The diamenter of point set, Random sampling, Linear programming.

Graph algorithms: All pairs shortest paths, The min cut problem, Minimum Spanning tree,

Unit V:

Parallel and Distributed Computing: The PRAM Model, Sorting on a PRAM, Maximal independent sets, Perfect Matching, The choice coordinate problem, Byzantine Agreement.

References

Randomized Algorithm by Motwani and Raghavan, Cambridge press.
NEURAL NETWORKS - CS612

Theory -

Sessional -

Contact Hours - Lectures - 3 Tutorial - 1


Adaptive multi-layer networks, prediction networks, radial basis functions, polynomial networks and regularization.

Difference between supervised and unsupervised learning, counter-propagation networks, adaptive resonance theory, neocognitron.

Hopfield networks, Boltzmann’s training, bi-directional associative memory networks.

Various types of optimization methods such as gradient descent, simulated annealing etc.

Applications of neural networks in the areas of clustering and classification problems, pattern recognition, function approximation, forecasting, vector quantization etc.

References


2. Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India.

COMPUTER VISION & IMAGE PROCESSING CS613

Theory -

Sessional -

Contact Hours - Lectures - 3 Tutorial - 1

Unit I


Unit II


Image Restoration: - Degradation models for continuous function, effect of diagonalization, on-degradation, algebraic approach to restoration, interactive restoration, Gray level interpolation.

Unit III

Image Encoding and Segmentation: - Encoding, Mapping, Quantizer and Coder.

Segmentation: - Detection of discontinuation by point detection, line detection, edge detection.

Unit IV

Edge linking and boundary detection:- Local analysis, global by graph, theoretic techniques. Thresh-holding: - definition, global thresh-holding.

Unit V

Filtering:- median, gradient, simple method of representation signatures, boundary segments, skeleton of region.


Noncausal representation, Linear prediction in two-dimensions, two-dimensional spectral factorization & estimation , Image decomposition , Fast KL transforms , Stochastic decoupling.
Image observation models, Inverse & Weiner fittening, FIR Weiner fitters, Fittening using Image transforms, Least square fitters, Generalized inverse, SVD & iterative methods.

Spatial feature Extraction, Transform feature, Edge detection, Boundary extraction, Boundary Representation, Region representation, Moment representation.

Structures Shape features, Texture, Scene matching & detection, Image Segmentation, Classification techniques, Image understanding.


References

1. “Digital Image Processing” by Gonzalez & Wood

**BIO-INFORMATICS CS602**

Theory -

Sessional -

Contact Hours - Lectures - 3 Tutorial - 1

Unit I:

Introduction to Bioinformatics and Computational Genomics, Biological databases, Kinemages for biological structure, Dynamic Programming Sequence Alignment, BLAST, FASTA.

Unit II:

3D structure computations, NMR, Xtallography, RNA secondary structure, Intro to Microarrays, review of structural genomics, Microarray Clustering and Classification, vector machine applications in Bioinformatics.

Unit III:

Terminologies and Ontologies, Multiple Sequence Alignment, 1D Motifs, Algorithms and Databases, 3D structure alignment, MUSTA algorithm for geometric hashing and multiple alignment
Unit IV:

Hidden Markov models, Molecular energetics and dynamics, Protein structure prediction, Genetic networks, Gene finding algorithms.

Unit V:

Comparative genomics algorithms, Genome Alignment, Phylogenetic algorithms, Natural Language Processing, Proteomics, 3D motifs & Final Thoughts

References


Laboratory

The principal goal of the Laboratory for Computer Science (LCS) is to conduct research in all aspects of computer science and information technology.

LABORATORY – 01

1. Understanding the operating environment – Linux and Windows NT (System Calls)
2. API Programming
3. Client server programming using CGI
4. Implementation using Remote method invocation
5. Implementation of Advance Data Structure in C under Linux.
6. Study of Rational Rose

LABORATORY – 02

1. Socket Programming
2. Tcl/Tk Programming
3. VHDL programming
4. Rapid application Development
5. Transaction Management using MYSQL