VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY: BURLA
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Curriculum for M.Tech – COMPUTER SCIENCE & ENGINEERING (REGULAR)

1st SEMESTER M.TECH.

MCS101 ADVANCED DATA STRUCTURES AND ALGORITHMS (3-1-0) Cr.-4

Unit 1 **Complexity Analysis & Elementary Data Structures** **8hrs.**
Asymptotic notations - Properties of big oh notation - asymptotic notation with several parameters - conditional asymptotic notation - amortized analysis - NP-completeness- NP-hard – recurrence equations – solving recurrence equations – arrays – linked lists – trees.

Unit 2 **Heap Structures** **8hrs.**
Min-max heaps – Deaps – Leftist heaps – Binomial heaps – Fibonacei heaps Skew heaps – Lazy-binomial heaps.

Unit 3 **Search Structures** **8hrs.**
Binary search trees – AVL trees – 2-3 trees – 2-3-4 trees – Red-black trees – B-trees – splay trees Tries.

Unit 4 **Multimedia Structures** **8hrs.**
Segment trees – k-d trees - Point Quad trees - MX-Quad trees – R-trees – TV-trees.

Unit 5 **Applications** **8hrs.**
Huffman coding - Garbage collection and compaction – Topological sort Mincut maxflow algorithm – Activity networks Set representation – Set union and find operations – Counting binary trees.

References:

1. Thomas H.Corman, Charles E.Leiserson, Ronald I.Rivest, “Introduction to Algorithms”, Second Edition, PHI 2003.
2. E.Horowitz, S.Sahani and Dinesh Mehta, Fundamentals of Data Structures in C++, Galgotia, 1999.
3. Adam Drozdex, Data Structures and algorithms in C++, Second Edition, Thomason learning vikas publishing house, 2001.
4. G.Brassard and P.Bratley, Algorithmics: Theory and Practice, Printice Hall, 1988.
5. V.S.Subramanian, Principles of Multimedia Database Systems, Morgan Kaufman, 1998.

MCS 102 **ADVANCED COMPUTER ARCHITECTURE (3-1-0)Cr.-4**

Parallel Processing: Definition, Theory of Parallelism. Parallel Computer Models, Parallelism in Uni-processor computers, Implicit Parallelism vs. explicit parallelism, Levels of parallelism.Soft ware Parallelism, Hardware Parallelism.

Conditions of Parallelism: Data and Resource Dependencies, Control Dependence, Resource dependence, Berrnstein's condition, Hardware and software parallelism, Flow dependence, Anti dependence, output dependence, I/O dependence, unknown dependence.

Program flow Mechanism: Control flow versus data flow, Demand-driven mechanism, Comparison of flow mechanisms, Dataflow computer Architecture, Static dataflow and dynamic dataflow computer, Communication Latency, grain packing and scheduling in parallel programming environment, program partitioning, fine grain program, coarse grain program graph.

Parallel Interconnection Systems: Static and Dynamic Networks, Linear Array, Ring, Star, Tree, Mesh, Systolic Array, Chordal ring, Completely connected network, Cube connected cycles, Torus, K-ary-n cube, Barrel shifter, single stage interconnection network, Multistage Interconnection Networks, Control Structure, Node degree, diameter, Bisection width, symmetric, functionality, Network Latency, Bandwidth, Scalability, Data routing functions:- Permutation, Perfect shuffle exchange, Hypercube Routing function.

Pipelining: Linear pipe line processor, Asynchronous and Synchronous models, speed up, Efficiency, Throughput, Non linear pipe line processor, Instruction pipeline, pipeline hazards, Arithmetic pipeline.

Multiprocessor and multicomputers: Hierarchical bus system, crossbar and multi port memory, cross point switch, Flynn's classification: SISD, SIMD, MISD, MIMD, message passing, Loosely coupled and tightly coupled system.

Vector processor, memory hierarchy, CISC scalar processor, RISC scalar processor, C-access and S-access memory organization. Basic ideas on parallel algorithm, SIMD algorithm for matrix multiplication.

Fault-tolerance and reliability, Availability, System Performance attributes of parallel Computers.

Text Books:

1. Advanced Computer Architecture, by Kai Hwang Mc Graw Hill.
2. Introduction to Parallel Computing, 2nd Edition, Pearson Education by Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar.

Reference Books:

1. Computer Architecture – A quantitative approach By J.L Hennessy and D.A.Patterson (Morgan)
2. Computer Architecture and Parallel Processing, by K.Hwang and F.A. Briggs. Mc Graw Hill, International

MCS103 SOFTWARE ENGINEERING AND OOAD(3-1-0)Cr.-4

Unit 1: Managing software projects 8 hrs

Overview to software Project, Software Product and Software Process, Project management concepts, Responsibility of Software Project Manager, Software Project Planning, Metrices for project size Estimation, Project Estimation Technique, Project scheduling technique (WBS, PERT, Gantt Chart, CPM) and tracking, Staffing, Overview to Risk Management, Risk Management Activities, Software Quality Assurance, Software Configuration management (SCM): Goals, Objectives, SCM Activities, SCM tools and Standards.

Unit 2: Requirement Engineering and Specification 8 hrs

Requirement Engineering Definition, Req. Engineering Technique, Software Requirement and its objectives, Req. Engineering Activities, Software Requirement Specification (SRS): Goals, quality Quality and characteristics of good SRS, benefits, Uses and Components of SRS, SRS Structure, Specification technique, Formal Specification, Algebraic specification and Model based specification.

Unit 3: Software Design Strategies and Methods 8 hrs

What is good software Design? , Good Vs. Bad Design, Cohesion and Coupling: Classification of Cohesion and Coupling, Software Design Approach: Function Oriented Design and Object Oriented Design, Overview to SA/SD Methodology: Structure Analysis, Tools for structure Analysis, DFDs. Designing and Developing DFD Models Shortcoming of DFD, Extending DFD technique to Real time System, Structured Design, Tools for structure Design, Flow chart Vs. Structure chart, Transformation of DFD in to Structure Chart, Detail Design.

Unit 4: Object Oriented Software Engineering 8 hrs

Conventional methods for software engineering: Design Concepts and principles. Architectural design, Component level Design, User Interface Design, software Coding and Testing Techniques, Software testing Strategies: Black box and White box testing, Integration and system testing, Object Oriented Concepts and principles, Object Oriented Analysis, Object Oriented Design, UML, UML Diagram: USE Case Model, CLASS Diagram, Inter action diagram, Activity Diagram, State Chart Diagram, Object Oriented Software Development Object Oriented testing, Technical metrics for Object-Oriented Systems, Implementation and Maintenance.

Unit 5: 8 hrs

Software Reliability and Quality Management: Software reliability, Software Quality, Software Quality Management system, ISO Certification.

Computer Aided Software Engineering: Overview to CASE, CASE Tool Classification of CASE Tool, Characteristics of Case Tools, CASE for Future.

Component Based Software Engineering: Overview, Component based Software Development, Advantage, Limitations.

Software Re-Engineering: What is Software Re-Engineering? Benefits of Software Re-Engineering, Re-Engineering Activities, Software Reverse Engineering: Goals, Types of Reverse Engineering, Program Re-Structuring, Source Code Translation, Data Re-Engineering.

Reference Books:

1. Roger S. Pressman, “Software Engineering A Practitioners Approach”. Mc-Graw Hill Publication.
2. Ian Sommerville, “Software Engineering”, Pearson Education Asia.
3. Rajib Mall, “Fundamental of Software Engineering”, PHI

ELECTIVES I and II

MCS-104 Real-Time Systems (3-1-0)Cr.-4

Module – I

Introduction: What is Real Time? Applications of Real-Time Systems, A Basic Model of a Real-Time System, Characteristics of Real-time Systems, Safety and Reliability, Types of Real-Time Tasks, Timing Constraints, Modelling Timing Constraints.

Real-Time Task Scheduling: Some Important Concepts, Types of Real-Time Tasks and Their Characteristics, Task Scheduling, Clock-Driven Scheduling, Hybrid Schedulers, Event-Driven Scheduling, Earliest Deadline First (EDF) Scheduling, Real Monotonic Algorithm (RMA), Some Issues Associated with RMA, Issues in Using RMA in Practical Situations.

Module – II

Handling Resource Sharing and Dependencies Among Real-Time Tasks: Resource Sharing Among Real-Time Tasks, Priority Inversion, Priority Inheritance Protocol (PIP), Highest Locker Protocol (HLP), Priority Ceiling Protocol (PCP), Different Types of Priority Inversions Under PCP, Important Features of PCP, Some Issues in Using a Resource Sharing Protocol, Handling Task Dependencies.

Scheduling Real-Time Tasks in Multiprocessor and Distributed Systems: Multiprocessor Task Allocation, Dynamic Allocation of Tasks, Fault-Tolerant Scheduling of Tasks, Clocks in Distributed Real-Time Systems, Centralized Clock Synchronization, Distributed Clock Synchronization.

Module – III

Commercial Real-Time Operating Systems: Time Services, Features of a Real-Time Operating System, Unix as a Real-Time Operating System, Unix-Based Real-Time Operating Systems, Windows as a Real-Time Operating System, POSIX, A Survey of Contemporary Real-Time Operating Systems, Benchmarking Real-Time Systems.

Real-Time Databases: Example Applications of Real-Time Databases, Review of Basic Database Concepts, Real-Time Databases, Characteristics of Temporal Data, Concurrency Control in Real-Time Databases, Commercial Real-Time Databases.

Module – IV

Real-Time Communication: Examples of Applications Requiring Real-Time Communication, Basic Concepts, Real-Time Communication in a LAN, Soft Real-Time Communication in a LAN, Hard Real-Time Communication in a LAN, Bounded Access Protocols for LANs, Performance Comparison, Real-Time Communication Over Packet Switched Networks, Qos Framework, Routing, Resource Reservation, Rate Control, Qos Models.

Text Books:

1. Real-Time Systems, by Rajib Mall (Pearson Education)

Reference Books:

1. Liu, "Real-Time Systems", Pearson Education, 2001.
2. Alan Burns, Andy Wellings, "Real-Time Systems and Programming Languages 3/e", Addison Wesley.
3. Raymond A.Buhr and Donald L.Baily, "Introduction to Real-Time Systems", Prentice Hall.
4. Nissanke, "Real-Time System", Prentice Hall.

MCS 105 ADVANCED COMPUTER NETWORK (3-1-0)Cr.-4

Unit 1 : Direct link network : Framing, error detection and correction, Reliable transmission Ethernet(802.3), Wireless(802.11) System architecture, Physical layer, MAC layer, MAC management, 802.11b, 802.11a, switching and forwarding, Bridges and LAN switches, cell switching protocol in data link layer

Unit 2 : Packet switching and internetworking : Routing simple internetworking(I/P) Address Subneting global internet, Multicast, Broadcast, Multiprotocol(BGP, OSPF etc) Mobile IP, DHCP, MANET, Congestion Control algorithms

Unit 3 : Transport layer, congestion control: TCP, UDP, Remote Procedure Call, Congestion control and Resource allocation

Unit 4 : Application layer:

Name Services(DNS), Electronic mails(SMTP, MIME, IMAP), HTTP, SNMP, Multimedia applications(RTDSIPH323) PGP, SSH(Secure Shell), Transport layer security, IP security, Wireless security

Books Recommended :

1. Peterson L. and Davie S.B. - Computer Networks (A Systems Approach)

   Kaufmann Publishers, 4th Edition.
2. Schiller J. – Mobile Communications – Pearson Education, 2nd Edition

Books Reference:

1. Tanenbaum S. – Computer Networks - Pearson Education, 4nd Edition
2. Data Communication and Networking – Fourazon B. – TMH Publication
3. Comer D.E. – Internetworking with TCP/IP - PHI Publication
4. Talukdar A.K. – Mobile Computing – TMH (Reprint 2009)

MCS106 DATA MINING (3-1-0) Cr.-4

Unit 1 6hrs

Data Mining Functionalities – What Kinds of Patterns Can Be Mined? Classification of Data Mining Systems, Major Issues in Data Mining, Summary. Data Warehouse and OLAP Technology for Data Mining – What is a Data Warehouse? Differences between Operational Database Systems and Data Warehouses, But, Why have a separate Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture, Steps for the Design and Construction of Data Warehouses, A Three-Tier Data Warehouse Architecture, Types of OLAP Servers: ROLAP versus MOLAP versus HOLAP, Data Warehouse Implementation, Efficient Computation of Data Cubes, Indexing OLAP Data, Efficient Processing of OLAP Queries, Metadata Repository, Data Warehouse Back-Eng Tools and Utilities, Further Development of Data Cube Technology, Discovery-Driven Exploration of Data Cubes, Complex Aggregation at Multiple Granularities: Multifeature Cubes, Other Developments, From Data Warehousing to Data Mining.

Unit 2 6hrs

Data Preprocessing – Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation. Data Mining Primitives, Languages, and System Architectures – Data Mining Primitives: What Defines a Data Mining Task? Task-Relevant Data, The Kind of Knowledge to be Mined, Background Knowledge: Concept Hierarchies, Interestingness Measures, Presentation and Visualization of Discovered Patterns, A Data Mining Query Language, Syntax for Task-Relevant Data Specification, Syntax for Specifying the Kind of Knowledge to be Mined, Syntax for Concept Hierarchy Specification, Syntax for Interestingness Measure Specification, Syntax for Pattern Presentation and Visualization Specification, Putting it All Together-An Example of a DMQL Query, Architectures of Data Mining Systems.

Unit 3 6hrs

Concept Description: Characterization and Comparison, What is Concept Description, Data Generalization and Summarization-Based Characterization, Attribute-Oriented Induction, Efficient Implementation of Attribute-Oriented Induction, Presentation of the Derived Generalization, Analytical Characterization: Analysis of Attribute Relevance, Why Perform Attribute Relevance Analysis? Methods of Attribute Relevance Analysis, Analytical Characterization: An Example, Mining Class Comparisons: Discriminating between Different Classes, Class Comparison Methods and Implementations, Presentation of Class Comparison Descriptions, Class Description: Presentation of Both Characterization and Comparison, Mining Descriptive Statistical Measures in Large Database, Measuring the Central Tendency, Measuring the Dispersion of Data, Graph Displays of Basic Statistical Class Descriptions.

Unit 4 6hrs

Mining Association Rules in Large Databases, Association Rule Mining, Market Basket Analysis: A Motivating Example for Association Rule Mining, Basic Concepts, Association Rule Mining A Road Map, Mining Single-Dimensional Boolean Association Rules from Transactional Database, The Apriori Algorithm: Finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiently of Apriori, Mining Frequent Itemsets without Candidate Generation, Iceberg Queries, Mining Multilevel Association Rules from Transaction Databases, Multilevel Association Rules, Approaches to Mining Multilevel Association Rules, Checking for Redundant Multilevel Association Rules, Mining Multidimensional Association Rules for Relational Database and Data Warehouses, Multidimensional Association Rules, Mining Multidimensional Association Rules Using Static Discretization of Quantitative Attributes, Mining Quantitative Association Rules, Mining Distance-Based Association Rules, From Association Mining to Correlation Analysis, Strong Rules Are Not Necessarily Interesting: An Example, From Association Analysis to Correlation Analysis, Constraint-Based Association Mining, Metarule-Guide3d Mining of Association Rules, Mining Guided by Additional Rule Constraints.

Unit 5 6hrs

Classification and Prediction – What is Classification? What Is Prediction? Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Decision Tree Induction, Tree Pruning, Extracting Classification Rules from Decision Trees, Enhancements to Basic Decision Tree Induction, Scalability and Decision Tree Induction, Integrating Data Warehousing Techniques and Decision Tree Induction, Bayesian Classification, Bayes Theorem, Naïve Bayesian Classification, Bayesian Belief Networks, Training Bayesian Belief Networks, Classification by Backpropagation, A Multilayer Feed-Forward Neural Network, Defining a Network Topology, Classification Based of Concepts from Association Rule Mining, Other Classification Methods, k-Nearest Neighbor Classifiers, Case-Based Reasoning, Genetic Algorithms, Rough Set Approach, Fuzzy Set Approachs, Prediction, Linear and Multiple Regression, Nonlinear Regression, Other Regression Models, Classifier Accuracy, Estimating Classifier Accuracy, Increasing Classifier Accuracy, Is Accuracy Enough to judge a Classifier.

Unit 6 6hrs

Cluster Analysis – What Is Cluster Analysis, Types of Data in Cluster Analysis, Interval-Scaled Variables, Binary Variables, Nominal, Ordinal, and Ratio-Scaled Variables, Variables of Mixed Types, A Categorization of Major Clustering Methods, Classical Partitioning Methods: k-Means and k-Medoids, Partitioning Methods in Large Databases: From k-Medoids to CLARANS, Hierarchical Methods, Agglomerative and Divisive Hierarchical Clustering, BIRCH: Balanced Iterative Reducting and Clustering Using Hierarchies, CURE: Clustering Using Representatives, Chameleon: A Hierarchical Clustering Algorithm Using Dynamic Modeling, Density-Based Methods, DBSCAN: A Density-Based Clustering Method Based on Connected Regions with Sufficiently High Density, OPTICS: Ordering Points To Identify the Clustering Structure, DENCLUE: Clustering Based on Density Distribution Functions, Grid-Based Methods, STING: Statistical Information Grid, Wave Cluster: Clustering Using Wavelet Transformation, CLIQUE: Clustering High-Dimensional Space, Model-Based Clustering Methods, Statistical Approach, Neural Network Approach.

Unit 7 6hrs

Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Generalization of Structured Data Aggregation and Approximation in Spatial and Multimedia Data Generalization of Object Identifiers and Class/Subclass Hierarchies, Generalization of Class Composition Hierarchies, Construction and Mining of Object Cubes, Generalization-Based Mining of Plan Databases by Divide-and-Conquer, Mining Spatial Databases, Spatial Data Cube Construction and Spatial OLAP, Spatial Association Analysis, Spatial Clustering Methods, Spatial Classification and Spatial Trend Analysis, Mining Multimedia Databases, Similarity Search in Multimedia Data, Multidimensional Analysis of Multimedia Data, Classification and Prediction Analysis of Multimedia Data, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web. Applications and Trends in Data Mining – Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining, Social Impacts of Data Mining, Trends in Data Mining.

BOOKS:

1. Data Mining: – Concepts and Techniques by Jiawei Han and Micheline Kamber, -- Morgan Kaufmann Publisher (Elseviers)
2. Data Mining Techniques: - by A.K. Pujari,, Tenth Edition, Universities Press.

MCS191 Advanced Programming Laboratory – I

Program in JAVA to study the concepts classes and objects, inheritance, interface, packages, networking, RMI and Servlet.

1. Write a program in JAVA to multiply two complex numbers.
2. Write a program in JAVA to find the combination of two numbers inheriting from a class that calculates the factorial of a number.
3. Write a program in JAVA to design an employee pay roll system using interface.
4. Create a package to find the largest among n numbers. Write a program in JAVA to sort an array of n numbers using this package.
5. Write a program in JAVA to show the chatting between two persons using TCP/IP.
6. Write a program in JAVA to calculate the cost of n items purchased by a person using RMI.
7. Write a program in JAVA to design e-note sheet using servelet.

2ND SEMESTER M.Tech.

MCS-107 COMPUTER GRAPHICS (3-1-0)Cr.-4

Introduction: Display of entities, geometric computation and representation, graphics environments;

Working principles of display devices: Refreshing Raster scan devices, vector devices, cathode ray tube terminals, plotters;

Display of colors: Look-up tables, display of gray shades, half toning;

Display and drawing of graphics primitives: Point, line, polygon, circle, curves, and texts; Coordinate conventions: World coordinates, device coordinates, normalized device coordinates, view-port and window, zooming and panning by changing coordinate reference frames;

Computations on polygons: Point inclusion problems, polygon filling, polygon intersections, clipping, polygonization of a point set, convex hull computation, triangularization of polygons;

Transformations in 2D and 3D: Translation, Rotation, Scaling, Reflection;

Projection: Perspective and parallel projections, isometric projection, Transformation matrices;

Volume and surface representation: Polygonal meshes, parametric curves and surfaces, Cubic and Bi-cubic Splines, Voxels, Octree and Medial axis representation, Sweep representation, surfaces and volumes by rotation of curves and surfaces, Fractal modeling;

Hidden surface and Line Elimination: Elimination of back surfaces, Painters' algorithms, Binary space partitioning tree;

Rendering and visualization: Shading model, constant, Goraud and Phong shading, Ray tracing algorithm, Radiosity computation;

Computer animation: Fundamental concepts.

Books:

1. *Foley, "Computer Graphics: Principles and practice", 2nd Edition.*
2. *Mel Slater, "Computer Graphics and Virtual Environments 1/e", Pearson Education.*
3. *D.F.Rogers, "Procedural elements for Computer Graphics", Mc. Graw Hill, 1985.*
4. *K. A. Plastock and Borden Kelly: Schaum's Outline of Computer Graphics, 1986.*
5. *Newman and Sproull : Principles of interactive Computer Graphics, Mc. Graw Hill, International Students Edition, Kogakusha, 1981.*
6. *S. Harrington : Computer Graphics A Programming Approach, Mc. Graw Hill, 1986.*

2ND SEMESTER M.Tech.
COMPILER CONSTRUCTION (3-1-0)Cr.-4

MCS-108

Module – I

Introduction:-

Compilers, Phases and passes of a compiler, Compiler Construction tools.

Laxical Analysis:-

Role of LA, Input Buffering, token specification and recognition, FA and RE, Design of a LA generator.

Module – II

Syntax Analysis:-

Parser, CFG, Top Down parsing, Bottom up parsing, Operator Precedence parsing, LR parsers, parser generators, SLR parser, LALR parser.

Module – III

Syntax Directed Translation:-

Syntax tress, S – attributed and L – attributed data, Top – Down translation, Bottom-up evaluation of inherited attributes, Analysis of syntax directed definitions.

Type Checking:-

Type Systems, type checker, Equivalence of type expressions, Type Conversions, Overloading functions and operators.

Runtime Environments:-

Storage Organisation, Storage Allocation strategies, Parameter Passing, Symbol tables, Dynamic Storage Allocations.

Module – IV

Intermediate Code Generation:-

Intermediate long Declarations, Assignment statements, Boolean Expressions, Back patching, Procedure Calls.

Code Generation:-

Code generator, runtime storage management, Basis Blocks and flow graphs, Next-use Information, Register Allocation and assignment, DAG representation, Peephole Optimization.

Code Optimization:-

Sources of optimization, Global data flow analysis, Data flow equations, Aliases, Structured flow graphs, Data flow Algorithm, Estimation of types, Symbolic debugging.

Text Book

1. Compilers : Principles, Techniques & Tools, by A.V. Aho, R.Sethi, J.D.Ullman, Pearsonn Education:

2ND SEMESTER M.Tech.

MCS-109 INTERNET TECHNOLOGY (3-1-0)Cr.-4

TCP/ IP:
TCP/IP Overview, TCP/IP and Internet, Layers of TCP/IP, Network Layer: Addressing, Subnetting, concepts of ARP, RARP, ICMP, IGMP. Transport Layer: UDP & TCP, Application Layer: Client server model, BOOTP, DHCP, DNS, TELNET, FTP, SMTP model, HTTP, idea of WWW and CGI.

Web Design:
HTML and Tags, Image, color and background, Image map, style sheet, table, frame, creating hyperlinks and anchors, text formatting tags, Designing forms and controls, DHTML, DHTML object model.

Java Script and XML:
Java script, programming overview, detailed of language, server side and client side scripting, example of simple email program, Introduction to XML, XML document syntax, document type decimation, example XML technology.

Core JAVA:
JAVA fundamentals, overview of JAVA operators, control statements, introducing classes, inheritance, exception handling, AWT, working with window graphics and text, AWT controls, Layout manager.

Advanced JAVA:
Introducing threading, advantages, Multi-threading, JAVA and networking, TCP/IP client sockets, Whois, URL, Server sockets, Overview of a caching Proxy HTTP server.

Applets and JDBC:
Introducing Applets, Architecture of an applet, skeleton, HTML APPLET tag, Event Handling, JDBC, Connecting to a database, transactions and executing SQL query, JDBC interface, Callable and prepared statements, Introduction to swing.

Network Security:
Network security basics and needs, cryptography, encryption and decryption, Ciphertext, types of cryptography: symmetric and asymmetric, RSA algorithm, Digital Signature, Organizational security issues and firewall architecture.

Reference Books:

1. Data communication and Networking - Forouzan
2. HTML and DHTML - Laura Leray, SAMS, Techmedia
3. Complete Reference JAVA - Naughton Schildt
4. Web Technologies – Achyut S Godbole and Atul Kahate

2ND SEMESTER M.Tech.
GROUP-II FOR SECOND SEMESTER
(For Elective – I & II in Second Semester)

COMPUTATIONAL INTELLIGENCE (3-1-0)CR.-4

MCS-112

Introduction to Soft Computing: Soft computing constituents and conventional Artificial Intelligence, Neuro-Fuzzy and Soft Computing characteristics.
Fuzzy Sets, Fuzzy Rules and Fuzzy Reasoning: Introduction, Basic definitions and terminology, Set-theoretic operations, MF Formulation and parameterization, More on fuzzy union, intersection, and complement, Extension principle and fuzzy relations, Fuzzy If-Then rules, Fuzzy reasoning.
Fuzzy Inference System: Mamdani fuzzy models, Sugeno Fuzzy Models, Tsukamoto fuzzy models, other considerations.
Least Square Method for system Identification: System Identification, Basic of matrix manipulations and calculus, Least-square estimator, Geometric interpretation of LSE, Recursive least-square estimator, Recursive LSE for time varying systems, Statistical properties and maximum likelihood estimator, LSE for nonlinear models.

Derivative-based optimization: Descent methods, the method of steepest descent, Newton's methods, Step size determination, conjugate gradient methods, Analysis of quadratic case, nonlinear least-squares problems, Incorporation of stochastic mechanism.

Derivative-free optimization: Genetic algorithm simulated annealing, random search, Downhill simplex search.

Adaptive Networks: Architecture, Back propagation for feed forward networks, Extended back propagation for recurrent networks, Hybrid learning rule: combing steepest descent and LSE.

Supervised learning neural networks: Perceptrons, Adaline, Back propagation multi layer perceptrons, Radial Basis Function networks.

Learning from reinforcement: Failure is the surest path to success, temporal difference learning, the art of dynamic programming, Adaptive heuristic critic, Q-learning, A cost path problem, World modeling, other network configurations, Reinforcement learning by evolutionary computations.

Unsupervised learning and other neural networks: Competitive learning networks, Kohonen self-organizing networks, learning vector quantization, Hebbian learning, principal component networks, and The Hopfield network.

Adaptive Neuro-fuzzy inference systems: ANFIS architecture, Hybrid learning algorithms, Learning methods that cross-fertilize ANFIS and RBNF, ANFIS as universal approximator, Simulation examples, Extensions and advance topics.

Coactive Neuro-fuzzy modeling: towards generalized ANFIS: Framework, Neuro functions for adaptive networks, Neuro-Fuzzy spectrum, Analysis of adaptive learning capability.

Books:

1. J.S.R. Jng, C.T. Sun and E. Mizutani, "Neuro-fuzzy and soft Computing", PHI.
2. S.Rajasekaran, G.A. Vijaylakshmi Pai, "Neural Networks, Fuzzy Logic, and Genetic Algorithms", PHI.

2ND SEMESTER M.Tech.
GROUP-II FOR SECOND SEMESTER
(For Elective – I & II in Second Semester)

DIGITAL IMAGE PROCESSING(3-1-0)Cr.-4

MEC-115

Module I

Digital Image Representation, Digital Image Processing System, Visual Perception, Sampling and Quantization, relationship between Pixels, Fourier Transforms, Walsh, Hadamard and Discrete Cosine Transforms.

Module II

Spatial and Frequency domain methods, Enhancement by point Processing, Spatial Filtering, Enhancement in the Frequency Domain, Generation of Spatial Masks from Frequency Domain Specifications, Color Image Processing.

Module III

Image Restoration

Degradation Model, Diagonalization of Circulant and Block Circulant of Matrices. Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filter, Constrained Least squares restoration, Iterative Restoration, Restoration in the Spatial Domain.

Module IV

Image Compression

Fundamentals, Image Compression Models, Elements of Information Theory, Error-Free Compression, Image Compression Standards.

Image Segmentation

Detection of Discontinuity, Edge linking and Boundary Detection, Thresholding, Region-Oriented Segmentation, The use of Motion in Segmentation.

Text Books:

1. Digital Image Processing - R.C.Gonzalez & R.E.Wood, Addison Wesley

Reference Book:

1. Digital Image Processing and Analysis, B.Channda & D.Dutta, Prentice Hall
2. Fundamentals of Digital Image Processing, Anil Ku Jain, PHI
2. Fundamental of Electronic Image Processing, Arther R. Weeks Jr. PHI

2ND SEMESTER M.Tech.
GROUP-II FOR SECOND SEMESTER
(For Elective – I & II in Second Semester)

EMBEDDED SYSTEMS(3-1-0)Cr.-4

MEC - 116

Introduction

An Embedded system, Processor in the system, Other hardware units, Software embedded into a system, Exemplary embedded systems, Embedded System-on-chip (SOC) and in VLSI circuit.

Devices and Device Drivers

I/O Devices, Timer and counting devices, Serial communication using the 'I^2C', 'CAN' and advanced I/O buses between the networked multiple devices, Host system or computer parallel communication between the networked I/O multiple devices using the ISA, PCI, PCI-X and advanced buses, Device drivers, Parallel port device drivers in a system, serial port device drivers in a system, Interrupt servicing (Handling) mechanism.

Software and Programming Concept

Processor selection for an embedded system, Memory selection for an embedded system, Embedded programming in C++, Embedded programming in Java, Unified Modeling Language (UML), Multiple processes and application, Problem of sharing data by multiple tasks and routines, Inter process communication.

Real Time Operating System

Operating system services, I/O subsystems, Network operating systems, Real-Time and embedded system operating systems, Need of a well tested and debugged Real-Time Operating System (RTOS), Introduction to mC/OS-II.

Case Studies of Programming with RTOS

Case study of an embedded system for a smart card.

Hardware and Software Co-design

Embedded system project management, Embedded system design and co-design issues in system development process, Design cycle in the development phase for an embedded system, Use of software tools for development of an embedded system, Issues in embedded system design.

Reference Books:

1. *Embedded Systems-Architecture, Programming and Design – Raj Kamal, TMH*
2. *Hardware Software Co-design of Embedded Systems – Ralf Niemann, Kluwer Academic.*
3. *Design Principles of Distributed Embedded Applications – Hermann Kopetz, kluwer Academic.*
4. *Embedded Real-Time Systems Programming – Sriram V. Iyer and Pankaj Gupta,TMH.*

2ND SEMESTER M.Tech.
GROUP-II FOR SECOND SEMESTER
(For Elective – I & II in Second Semester)

DATABASE ENGINEERING(3-1-0)Cr.-4

MCS-111

Entity-Relationship Model & Relational Model

Basic concepts, Entity-Relationship Diagram, Extended E-R Features, Design of an E-R Database Schema, Reduction of E-R Schema to tables, Structure of Relational database, The Relational algebra, Extended relational algebra operations, Modification of database, The tuple Relational calculus, The Domain relational calculus

Relational data Base Query system

SQL: Set operation, Aggregate Functions, Nested subqueries, complex queries, Modification of the database, Joined relations, Data-Definition Language, Embedded SQL, Dynamic SQL, Query-by-Example, Datalog, User Interfaces and Tools.

Relational Database Design

First Normal form, Pitfall in relational-database design, Functional Dependencies, Decomposition, desirable properties of Decomposition, Boyce-Codd Normal Form, Third Normal Form, Fourth Normal Form, More Normal Forms, Overall database Design process.

Transaction Management

Transaction concept, Transaction state, Implementation of Atomicity and durability, concurrent executions, serializability, recoverability, implementation of isolation, concurrency control: lock-based, timestamp based, validation based protocol, multiple granularity, multiversion schemes, deadlock handling,

Data Security and Recovery

Failure classification, storage structure, Recovery and atomicity, Log based recovery, Shadow paging, Recover with concurrent Transaction, Buffer management, Failure with loss of Nonvolatile storage, advanced Recovery Techniques, Remote backup System

Object-Oriented Database and Object-Relational Database

Need for Complex Data Types, The Object-Oriented data Model, Object-Oriented Languages, Persistent programming Languages, Nested Relations, complex Types, Inheritance, Reference Types, Querying with Complex Types, Functions and Procedures, Object-Oriented vs. Relational

Database System Architecture

Centralized and Client server Architecture, server system Architecture, parallel systems, distributed Systems, Network Types.

Distributed Databases

Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit protocols, Concurrency control in distributed Database, Distributed query processing, Heterogeneous Distributed Database, Dictionary system.

Parallel Databases

Introduction, I/O parallelism, Interquery parallelism, Intraoperation parallelism, Interoperation Parallelism, design of parallel systems.

Data Mining and Warehousing

Data warehousing, Data warehousing process, Data ware housing architecture, Data warehouse components, and reasons for Data warehousing.

Advance Topics in Database system

Web interface to database, performance tuning and performance Benchmarks, Time in database, Spatial and geographical data, Spatial database, Temporal database, Multimedia database, Mobility and personal database

References Books:

[1] Silberschatz, Korth, and Sudarshan, " Database system Concepts, 4/e, Tata-Mc-Graw Hill.

[2] Date, "Introduction to database Systems, 7/e", Pearson Education India.

[3] Ullman, " A First Course on database Systems", Pearson Education India.

[4] Gracia-Molina, "Data Base System Implementation, Pearson Education India.

2ND SEMESTER M.Tech.
GROUP-II FOR SECOND SEMESTER
(For Elective – I & II in Second Semester)

MOBILE COMPUTING(3-1-0)Cr.-4

Overview of wireless technologies: Signal propagation, Multiplexing, Modulation and Spread Spectrum techniques;

Media access control: FDMA, TDMA, CDMA;

Cellular System: AMPS, GSM, DECT, UMTS, IMT-2000;

CDMA-based cellular system;

Satellite systems: basic routing, localization and handoff issues;

Wireless networks: packet radio networks, wireless LAN, IEEE 802.11b, Blue tooth, Wireless ATM; Wireless Application Protocol (WAP) and WML;

Mobile Networking: Mobile IP, Ad-hoc networks: AODV, DSR, DSDV routing;

Wireless TCP: indirect TCP, Snooping TCP, Mobile TCP, Information Management,

Location-independent and location-dependent computing models, Mobile applications and services, Security.

Suggested text books and references:

1) Schiller, “Mobile Communication”, Pearson Press.
2) Pahlavan, “Principles of Wireless Networks”, Pearson Press.
3) Willium Stallings, “Wireless Communication and Networks”, Prentice hall.
4) Bob O’Hara, A Petrick, “The IEEE 802.11 Handbook: A designer’s Companion”
5) K. Watson, T. Wogofski, W.M.Lee, F.S.Mee, “Beginning WAP: WML And WML Script”, Wrox Press.

2ND SEMESTER M.Tech.

Elective – III & IV

MCS111 COMPUTATIONAL INTELLIGENCE (3-1-0) CR.-4

Introduction to Soft Computing: Soft computing constituents and conventional Artificial Intelligence, Neuro-Fuzzy and Soft Computing characteristics.
Fuzzy Sets, Fuzzy Rules and Fuzzy Reasoning: Introduction, Basic definitions and terminology, Set-theoretic operations, MF Formulation and parameterization, More on fuzzy union, intersection, and complement, Extension principle and fuzzy relations, Fuzzy If-Then rules, Fuzzy reasoning.
Fuzzy Inference System: Mamdani fuzzy models, Sugeno Fuzzy Models, Tsukamoto fuzzy models, other considerations.
Least Square Method for system Identification: System Identification, Basic of matrix manipulations and calculus, Least-square estimator, Geometric interpretation of LSE, Recursive least-square estimator, Recursive LSE for time varying systems, Statistical properties and maximum likelihood estimator, LSE for nonlinear models.

Derivative-based optimization: Descent methods, the method of steepest descent, Newton's methods, Step size determination, conjugate gradient methods, Analysis of quadratic case, nonlinear least-squares problems, Incorporation of stochastic mechanism.

Derivative-free optimization: Genetic algorithm simulated annealing, random search, Downhill simplex search.

Adaptive Networks: Architecture, Back propagation for feed forward networks, Extended back propagation for recurrent networks, Hybrid learning rule: combing steepest descent and LSE.

Supervised learning neural networks: Perceptrons, Adaline, Back propagation multi layer perceptrons, Radial Basis Function networks.

Learning from reinforcement: Failure is the surest path to success, temporal difference learning, the art of dynamic programming, Adaptive heuristic critic, Q-learning, A cost path problem, World modeling, other network configurations, Reinforcement learning by evolutionary computations.

Unsupervised learning and other neural networks: Competitive learning networks, Kohonen self-organizing networks, learning vector quantization, Hebbian learning, principal component networks, and The Hopfield network.

Adaptive Neuro-fuzzy inference systems: ANFIS architecture, Hybrid learning algorithms, Learning methods that cross-fertilize ANFIS and RBNF, ANFIS as universal approximator, Simulation examples, Extensions and advance topics.

Coactive Neuro-fuzzy modeling: towards generalized ANFIS: Framework, Neuro functions for adaptive networks, Neuro-Fuzzy spectrum, Analysis of adaptive learning capability.

Books:

1. J.S.R. Jng, C.T. Sun and E. Mizutani, "Neuro-fuzzy and soft Computing", PHI.
3. S.Rajasekaran, G.A. Vijaylakshmi Pai, "Neural Networks, Fuzzy Logic, and Genetic Algorithms", PHI.

MCS112 BIO INFORMATICS (3-1-0)Cr.-4

Module - I

Introduction to Genomic data and Data Organization: Sequence Data Banks – introduction to sequence data banks – protein sequence data bank. NBFR-PIR. SWISSPORT. Signal peptide data bank, Nucleic acid sequence data bank – GenBank, EMBL nucleotide sequence data bank. AIDS virus sequence data bank. PRNA data bank, structural data banks- protein Data Bank (PDB). The Cambridge Structural Database (CSD) : Genome data bank – Metabolic pathway data; Microbial and Cellular Data Bank.

Module - II

Introduction to MSDN (Microbial Strain Data Network) : Numerical Coding Systems of Microbes, Hibridoma Data Bank Structure, Virus Information System Cell line information system; other important Data banks in the area of biotechnology/life sciences/biodiversity.

Sequence analysis: Analysis Tools for Sequence Data Bank: Pair wise alignment – NEEDLEMAN and Wunsch algorithm, Smith Waterman, BLAST, FASTA algorithms to analyze sequence data; Sequence patterns motifs and profiles.

Module - III

Secondary Structure Predictions; prediction algorithms; Chao-Fasman algorithm. Hidden-Markov model, Neural Networking.

Tertiary Structure predictions; prediction algorithms; Chao-Fasman algorithm. Hidden-Markov model, Neural Networking.

Module- IV

Application in Biotechnology : Protein classifications, Fold libraries, Protein structure prediction : Fold recognition's (threading), protein structure predictions : Comparative modeling (Homology), Advanced topics : Protein folding, Protein-ligand interactions, Molecular Modeling & Dynamics, Drug Designing.

Text Books:

1. Lesk, Introduction to Bio Informatics, OUP
2. Introduction to Bio-informatics, Atwood, Pearson Education
3. Developing Bio-informatics Computer Skills, Cynthia Gibas andd Per Jambeck. 2001 SPD
4. Murty CSV, Bioinformatics, Himalaya