

Syllabus for
M. Tech.(Computer Science & Engineering)
 (Offered by Netaji Subhash Engineering College under West Bengal University of
 Technology)
 Duration: Four Semesters

Credit Structure:

Semester	Core Theory Credits	Elective Theory Credits	Practical Credits	Seminar/Term Paper/Viva-voce	Project	Total
I	12	8	4	Nil	Nil	24
II	12	8	4	2	Nil	26
III	Nil	8	2	2	6	18
IV	Nil	Nil	Nil	2	10	12
Total	24	24	10	6	16	80

Semester - I

SI No.	Subject Code	Subject Name	LTP	CP
1	MCS-101	Computer Organization & Architecture	3-1-0	4
2	MCS-102	Data Structure & Algorithms	3-1-0	4
3	MCS-103	Systems Programming & Operating Systems	3-1-0	4
4	**	Elective I	4-0-0	4
5	**	Elective II	4-0-0	4
6	MCS-111	Data Structure & Algorithms Laboratory	0-0-3	2
7	MCS-112	Networks & System Programming Laboratory	0-0-3	2
Total			17-3-6	24

** The choice of Electives are from the list below.

List of Elective-I subjects

SI No.	Subject Code	Subject Name
1	MCS-104A	Web Technology & E-Commerce
2	MCS-104B	Internet Technology
3	MCS-104C	Advanced Windows Programming

List of Elective-II Subjects

SI No.	Subject Code	Subject Name
1	MCS-105A	Elements of Robotics
2	MCS-105B	Mobile Computing
3	MCS-105C	Software Engineering & Project Management

Semester - II

SI No.	Subject Code	Subject Name	LTP	CP
1	MCS-201	Theoretical Foundations of Computer Science	3-1-0	4
2	MCS-202	Advanced Data Base Management System	3-1-0	4

Syllabus for
M. Tech.(Computer Science & Engineering)
 (Offered by Netaji Subhash Engineering College under West Bengal University of
 Technology)

3	MCS-203	Distributed Computer Systems	3-1-0	4
4	**	Elective III	4-0-0	4
5	**	Elective IV	4-0-0	4
6	MCS-211	Advanced Data Base Laboratory	0-0-3	2
7	MCS-212	Programming Laboratory I(for Elective III chosen)	0-0-3	2
8	MCS-221	Term Paper & Seminar	----	2
Total			17-3-6	26

** The choice of Electives are from the list below.

List of Elective-III subjects

SI No.	Subject Code	Subject Name
1	MCS-204A	VLSI System Design
2	MCS-204B	Real Time & Embedded System
3	MCS-204C	Cellular Automata & Its Applications
4	MCS-204D	AI & Neural Network

List of Elective-IV subjects

SI No.	Subject Code	Subject Name
1	MCS-205A	Object Oriented Information System Design
2	MCS-205B	Enterprise Computing Methodologies
3	MCS-205C	Multimedia Technology
4	MCS-205D	Digital Signal Processing

Semester - III

SI No.	Subject Code	Subject Name	LTP	CP
1	**	Elective V	4-0-0	4
2	**	Elective VI	4-0-0	4
3	MCS-311	Programming Laboratory II (for Elective V chosen)	3-0-0	2
2	MCS-321	Project Work (Phase-I)	---	6
3	MCS-322	Seminar	---	2
Total			4-0-0	18

** The Choice of Electives is from the list below.

List of Elective-V subjects

SI No.	Subject Code	Subject Name
1	MCS-301A	Image Processing & Pattern Recognition
2	MCS-301B	Bio-informatics
3	MCS-301C	Soft Computing
4	MCS-301D	Courseware Engineering

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

List of Elective – VI subjects

Sl No.	Subject Code	Subject Name
1	MCS-302A	Advanced Microprocessors
2	MCS-302B	Parallel Computing
3	MCS-302C	Compiler Construction
4	MCS-302D	Cryptography and Computer Security

Semester – IV

Sl No.	Subject Code	Subject Name	LTP	CP
1	MCS-421	Project Work (Phase-II) & Seminar	---	10
2	MCS-422	Viva-voce	---	2
Total				12

Detailed Syllabi

MCS-101

Computer Organization & Architecture

Digital computer components-- Organization of ALU, Combinational circuits, Hazards of combinational circuits, Sequential circuits, algorithms of addition, subtraction, multiplication and division.

Memory hierarchy, Cache memory organizations, techniques for improving cache hit ratio, Virtual memory organization

Addressing modes, Instruction sequencing and microprogramming, hardware/firmware implementation of the control structure.

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

Pipelining concepts in CPU design, Pipeline hazards – structural hazards, data hazards, control hazards & their solutions, RISC architecture, RISC VS CISC, Vector and Array Processors, Super-scalar machines, Distributed computing architectures, Hardware support for memory management

Performance evaluation: SPEC marks and other standard benchmarks.

Case Studies: Pentium, Ultra Sparc, Power PC

References:

- [1] Digital circuits (Part-I & Part-II)- D.RoyChoudhary [Eureka publishers]
- [2] Computer System Architecture – Mano [PHI]
- [3] Computer architecture and parallel processing - Hwang & Briggs [TMH]
- [4]Computer Architecture- Hennessey & Patterson [Morgan Kaufman]
- [5] Computer Architecture - Flynn [New Age]

MCS-102

Data Structure & Algorithm

Algorithm: Definitions and properties, complexity analysis: time and space complexity, average case, worse case, and best case complexities, order notations: big Oh, big omega, big theta and small Oh, different categories of algorithms, P, NP, NP-complete, NP-Hard categories of algorithms, cook's theorem, approximation algorithms.

Data Structure: Definition, Basic Concepts, ADT

Array: Definition, Memory Allocation, Single & Multidimensional Array, Addressing Scheme, Sparse Matrices, Polynomial representation.

String: String operations, Implementation of strings on 2D and multidimensional.

Link List: Dynamic memory Allocation, Single Linked & multiply linked list- Different operations, Advantages and application, Circular linked lists, Linked lists as an ADT.

Stack and Queue: Definition and implementation using arrays.

Recursion: Solution, refinement and analysis, application to various search problems likegame trees, tail recursion and when not to use recursion.

Tables and Information Retrieval: Hashing: Hash function, collision resolution using methods, analysis of hashing, symbol tables.

Searching: Binary search, linear search, interpolation, search and analysis.

Sorting: External and internal sorting, lexicographical sorting.

Tree: Definition and terminologies, tree traversals: in-order, preorder and post-order, tree as an ADT, applications to problems, BST: insertion, deletion, tree sort. AVL tree, balance multi way search tree, red and black tree, tries.

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

Graph: Definition, computer representation of graphs, graph traversals: BFS & DFS, minimum spanning tree: Kruskal's and Prim's algorithm, shortest path algorithm: Dijkstra's and Warshall-Floyd algorithm, graph colouring-chromatic number, algorithm for transitive closure, topological sort, and critical paths

Files: Files, queries and sequential organization, index techniques file organizations, storage management.

Reference:

- [1] Kruse, Leung and Tondo: Data Structure and Program Design in C, [PHI]
- [2] Horowitz & Sahani: Fundamental of Data Structures, [Galgotia]
- [3] Tannenbaum: Data Structure in C & C++, [PHI]

MCS-103

Systems Programming & Operating Systems

Overview: Loader, linker, assembler, command interpreter, compiler, operating system.

Various kinds of language translators: interpreters, compilers, cross compilers.

The Flow of Compilation process: lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization, code generation.

Overview of operating systems: process management-process model, interprocess communication and synchronization, critical section problem and solutions, semaphore primitives, process scheduling algorithm.

Deadlock: condition for deadlock, deadlock prevention and avoidance, recovery.

Memory Management: multiprogramming with a fixed and variable number of tasks (MFT), fragmentation, paging, segmentation, virtual memory management.

File Management & I/O System: File and record organizations, directory structure, file security, file space allocation, disk scheduling.

Case Studies: Windows, Unix, Linux.

Reference:

- [1] System Programming and Operating System- Dhamdhare [TMH]
- [2] System Programming- Donovan [McGraw Hill Int'l Stud. Ed.]
- [3] Operating System- Galvin, Silberschatz & Gagne [Wiley]
- [4] Modern Operating System- Tanenbaum [PHI]
- [5] Advanced Unix Programming in the Unix Environment- Stevens [Pearson]

MCS-104A

Web Technology & E-Commerce

Introduction to Internet:

Overview: Evolution of the Internet, How Internet Works.

Services offered on the Internet: E-mail, Network News, Telnet, FTP, IRC.

Internet Access Method: Dial-up connection, Leased line, ISDN.

Internet Services Providers (ISP): Architecture, Connection through an ISP Server, **World Wide Web**

Browsing: URL, Homepage, document management, cookies, plug-in, online & offline Browsing.

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

WWW: History of WWW, different web generations, W3C.

Search Engines: Technology Overview. Popular search engines, how to register a web site on search engines.

Mark-up Languages:

HTML & XHTML: Basic layout of HTML, Head Section: title, base, link, meta. Body Section: Text formatting and alignment, fonts, colors, ordered and unordered lists, links, images, sounds, video, background, tables, forms, frames. Introduction to XHTML,

DHTML: Cascading style sheet, inline styles, embedded style, linking external style sheets, positioning elements, user style sheets, document object model.

XML: Structuring data, XML namespaces, DTD and schemas, XML variables, DOM methods, simple API for XML, web services, application of XML.

Web Development using Scripting Language:

JavaScripts: Introduction to scripting, user input/output, memory concepts, arithmetic, decision making, control statement, functions, arrays, objects.

VB Scripts: Operators, data types and control statements, functions, arrays, string manipulation, classes & objects.

Active Server Pages (ASP): How ASP works, ASP objects, file system, objects, ActiveX components, .NET overview, XML: Case study.

Java Technologies:

Overview of Java, Use of Java for web development.

Java Applets: Applet architecture, applet class, life-cycle of applets, display methods requesting repainting, using the status window, HTML applet tag, passing parameter to applets.

Servlets: Servlet architecture and life-cycle, handling HTTP post & get request, multi-tier application using JDBC from servlet.

JSP: Architecture, standard actions, JSP with JDBC.

J2EE & EJB: Component architecture, introducing enterprise JavaBeans, J2EE Technologies, foundation for EJB, EJB objects and Bean Instances.

Web Servers (IIS/PWS & Apache):

HTTP request types, system architecture, client-side scripting, accessing web servers requesting documents.

E-Commerce:

Introduction to E-Commerce: Definition, framework, applications, merits and demerits. IT Act 2000, Software Agents.

Business Model for E- Commerce: B2B, B2C, C2C, C2B

E-Security: Trust based security, password scheme, cryptography & firewall concept.

E-Payment Standard: Digital token-based system, smart cards, micro-payments, e-cash, designing e-payments system, digital signature.

E-SCM & E-CRM.

Reference:

[1] A.S. Godbole, Atul Kahate, *Web Technology: TCP/IP to Internet Application Architecture [TMH]*.

[2] *The Whole Internet: The next Generation [SPD]*

[3] Jesse Feiler, *Managing the Web Based Enterprise[Morgan Kaufmann]*

[4] Chuck Musciano & Bill Kennedy, *HTML & XHTML [SPD]*

[5] D. Hunter, et. Al. *Beginning XML [WROX]*

[6] R. Kalakota, A.B. Whinston, *Frontier of Electronic Commerce [Addition- Wesley]*

[7] P.T.Joseph, *E-Commerce: A Managerial Perspective [PHI]*

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

MCS- 104 B

Internet Technology

Basic Principles :

Evolution of Internet, Internet services, Internet protocols and standardization, TCP/IP, Review of Network technologies.

Architectural model, Application level , Network level, Properties of the Internet, Interconnection through IP Gateways or routers, Internet and Intranet.

Addressing Schemes :

Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicast addressing.

Protocols : Reliable and unreliable delivery, Connectionless delivery system, Routing direct and indirect delivery, Table driven IP routing, Protocol layering, Reliable stream transport, TCP performance, Bootstrap protocol (BOOTP).

Routing :

The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Gateways, Automatic route propagation, Vector distance (Bellman-Ford), routing, Gateway to Gateway Protocol (GGP), Autonomous system concept, Exterior Gateway Protocol (EGP), Interior Gateway Protocol (RIP, OSPF, HELLO), Routing Information Protocol (RIP), Combining RIP, HELLO, and EGP, Routing with partial information.

Enterprise Networking :

Corporate networking, Broadband at the Metropolitan area level, High speed dedicated WAN services and switched WAN services, ISDN, BISDN and ATM services, Frame relay technology and services, Virtual private network concepts PPTP protocol.

Internet Servers :

DNS, DHCP Servers, FTP, TELNET, E-Mail

Firewall & Networking :

Introduction, Implementation of Firewall, Activities of Firewall, Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL.

Reference:

1. *Computer Networks and Internets - Douglas E. Comer; PE.*
2. *Communication Networks - Leon-Garcia-Widjaja; TMH.*
3. *Internetworking with TCP / IP - Douglas E .Comer; PE.*
4. *TCP/IP protocol suite - Forouzan Behrouz A; TMH.*
5. *Computer Networks – Andrew S. Tannenbaum; PHI.*
6. *Data and Computer Communication - William Stallings; PHI.*
7. *The Complete reference of Networking - Craig Zacker; TMH.*

MCS-104C

Advanced Windows Programming

Introduction of Windows programming - Structure of windows programming, Event driven applicatin, What is X , & X windows system- Look & FEEL Philosophy, GUI & its components

Basic Programming Tools- Window Manager – MOTIF, Text & Graphics – Device context and mapping modes, Windows GDI, Printer device context, printer driver, Bitmap, Images, color map, frame buffer, Window controls – Crete window function, static control, list box, button control, combo box, scroll bar, edit control, Radio button, Mouse control-, Sets, fonts & key boards, Text matrix, Child & Popup window- Picture, menus- popup menu, Dialog Boxes- Modal vs modless dialog box. String tables- RCDATA

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

statement, managing memory – Global vs Local memory, Disk file access, clipboard, ICCCM- Exchanging data, DLL – Working principal of DLL, Import libraries, MFC- OOPS approach using C++,VC++

Books:

1. *Windows Programming – Conger*
2. *X Windows – Barkakati*
3. *Windows programming – Pedzol*

MCS-105A

Elements of Robotics

1. Robotic Kinematics – Introduction to Robots, manipulators, Robot arm geometry, forward and inverse kinematics problem, arm dynamics, D'Alembert's equation of motion, trajectory planning, Homogeneous transformations and co-ordinate frames.
2. Introduction to mobile robotics, Sensing and perception building in robotics, brief overview of digital image processing, segmentation of images, Fuzzy-C-means clustering applied to image segmentation.
3. Introduction to Neural Networks, multilayer perceptrons, back propagation learning, brief introduction to fuzzy set theory and fuzzy logic, fuzzy expert systems and rule based path planning of a mobile robot using back propagation neural networks (BPNN), fuzzy logic and Kalman filtering.
4. Introduction to visual sensing, edge finding, good targets, range & proximity, higher level vision.
5. Introduction to genetic algorithms and application of GA in mobile robot path planning and navigation. Target finding and goods carrying with two co-operating robots, introduction to multiagent co-operative robotics, concept of robot – soccars.

Reference:

- [1] Mittal & Nagrath - Robotics & Control.(T M H)
- [2] Foo & Lee – Robotics, Control, Sensing, Vision & Intelligence [McGraw Hill]
- [3] Amit Konar – Computational Intelligence, Principles, Techniques and Applications

MCS-105B

Mobile Computing

Introduction:

Applications: A short history of wireless communication

Wireless Transmission:

Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems.

Medium Access Control:

Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SOMA, FOMA, TOMA: Fixed TOM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, PRMA packet reservation multiple access, reservation TOMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access

Telecommunication Systems:

GSM: Mobile Services, System Architecture, radio interface, Protocols, Localization and Calling, Handover, Security, New Data Services; DECT; Systems Architecture; Protocol Architecture: TETRA, I UMTS and IMT-2000; UMTS Basic Architecture, UTRA FDD mode, UTRA TDD mode.

Satellite Systems:

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

History, Applications, Basics: GEO, LEO, MEO, Routing, Localization. Handover, Examples.

Broadcast Systems:

Overview, Cyclic Repetition, Digital Audio; broadcasting: Multimedia object transfer Protocol; Digital Video broadcasting.

Wireless LAN:

Infrared vs. Radio Transmission, Infrastructure and Ad Hoc networks, IEEE 802.11: System Architecture, Protocol Architecture, Physical Layer, Medium Access Control Layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical Layer Channel access control. Sublayer, Medium Access control sublayer, Information bases and networking; Bluetooth: User Scenarios, Physical Layer, MAC layer, Networking, Security, Link management.

Wireless ATM:

Motivation for WATM, Wireless ATM working group, WATM services, Reference model: Example configurations, Generic reference model; Functions: Wireless mobile terminal side, Mobility supporting network side; Radio access layer: Requirements, BRAN; Handover: Handover reference model, Handover requirements, Types of handover, Handover scenarios, Backward handover, Forward handover; Location management: Requirements for location management, Procedures and Entities; Addressing, Mobile quality of service, Access point control protocol.

Mobile Network Layer:

Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation, Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol, Ad hoc networks: Routing, Destination sequence distance vector, Dynamic source routing, Hierarchical algorithms, Alternative metrics.

Mobile Transport Layer:

Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile tcp, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP.

Support for Mobility:

File systems: Consistency, Examples; World Wide Web: Hypertext transfer protocol, Hypertext markup language, Some approaches that might help wireless access, System architectures; Wireless application protocol: Architecture, Wireless datagram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Wireless markup language; WML script, Wireless telephony application, Examples "Stacks with WAP, Mobile databases, Mobile agents

References

- [1] Jochen Schiller, "Mobile Communications ", 2nd Edition, Addison Wesley, Pearson Education
- [2] William Stallings, "Wireless Communications and Networks' , Prentice Hall-2005
- [3] Rappaport, "Wireless Communications Principles and Practices' , 2nd Edition, Prentice Hall
- [4] YI Bing Un , "Wireless and Mobile Network Architectures', John Wiley
- [5] P. Nicopolitidis, "Wireless Networks', John Wiley
- [6] M. Richharia, "Mobile Satellite Communication: Principles and Trends', Pearson Education

MCS-105C

Software Engineering & Project Management

Software Engineering Fundamentals:

Definition of software product, software engineering paradigms, Software engineering, knowledge engineering, and End user development approach, software engineering life cycle, process modules (Waterfall model, Spiral model)

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

System Analysis:

An abstraction, Partitioning and projection, system specification, software requirement specification (SRS) standards, formal specification methods, specification tools, flow based, data based and object oriented analysis (data flow diagram, data dictionary).

System Design:

Problem partitioning, abstraction, top down & bottom up strategies, modularity structure charts, idealized and constraint design (Warnier -Orr, E-R modeling), object oriented design (Booch approach), cohesion and coupling, design matrices, design documentation standard.

Role of CASE tools:

relevance of CASE tools, high-end low end CASE tools, automated support for data dictionaries, DFDs, ERDs.

Coding and Programming:

choice of programming languages, mixed language programming and cell semantics, structured programming, information hiding, documentation, re-engineering legacy systems, coding standard.

Software quality and testing:

software quality assurance, types of software testing (White box and Black box testing, unit testing integration testing, verification and validation of software), debugging and software reliability analysis, software quality and matrices, software maturity model and extensions.

Software Cost and Time Estimation:

functions points, issues in software cost estimation: Introduction to the Rayleigh curve, algorithmic cost models (CO-COMO, Putnam-Slim, Watson, and Felix), other approaches to software cost and size estimation (software complexity, Delphi, costing by analogy).

Software Project Management:

planning software, project, work breakdown structures, integrating software design and project planning, software project teams, project monitoring control.

References:

1. Software Engineering, Rogers G. Pressman, MH
2. Fundamentals of Software Engineering, 2nd Ed., Ghezzi, PHI
3. Software Engineering, Pankaj Jalote, PHI
4. Classical and Object Oriented Software Engineering, Schach, TMH
5. Software Engineering: Principles & Practice, Van Vliet, SPD/JOHN WILEY
6. Software Engineering, K.K. Aggarwal & Yogesh Singh, New Age International
7. Software Engineering, Leon, VIKAS
8. Software Testing Fundamentals: Methods & Metrics, Marmie Hutcheson, And Wiley Dreamtech
9. Managing for Total Quality, Logothetis, PHI
10. TQM, J. Kiron, EPH

MCS-201

Theoretical Foundations of Computer Science

1. Regular expressions and finite Automata:
Regular languages, Finite automata, Union, Intersections & complements. Non deterministic Finite automata, Kleene's theorem.
(Chapter 3 & 4)
2. Regular & Non regular languages:
Criterion for regularity, minimal Finite Automata, Pumping lemma, Decision problems, languages & computers.

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

- (Chapter 5)
3. Context-free grammars:
Derivation Trees & Ambiguity, An Unambiguous CFG for algebraic expressions, simplified forms and normal forms. (Chapter 6)
 4. Pushdown Automata:
Definition, Deterministic pushdown automata, A PDA corresponding to a given context-free grammar, context-free grammar corresponding to a given PDA, parsing.
(Chapter 7)
 5. Context-free and Non-Context-free languages:
The pumping lemma for context-free languages, Intersections & complements of context-free languages, decision problems involving context-free languages.
(Chapter 8)
 6. Turing Machines:
Definitions, computing partial functions, combining Turing machine, variation of Turing machines, Non-Deterministic Turing Machines, Universal Turing Machine, Church-Turing Thesis. (Chapter 9)
 7. Graph Theory:
Introduction, Isomorphism, Sub-graphs, walks, paths and circuits, connected graphs, disconnected graphs and components, Euler graphs, Operations on graphs, more on Euler Graphs, Hamiltonian paths and circuits, The traveling salesman problem, Chromatic number, Chromatic partitioning, Chromatic polynomial, Matchings.

Continuous-Parameter Markov chains and Queuing Theory:

Introduction, The Birth and death process, other special cases of the Birth-Death Model, Non-Birth-Death processes. (Chapter 8 Sec. 8.1, to 8.4 of Ref. 3) **6 Hrs.**

Text books

1. Introduction to languages & the theory of computation by John C Martin, Tata McGraw Hill publication Co. Ltd., 3rd edition, 2004.
2. Narsingh Deo – Graph Theory with Applications to Engineering & Computer Science – Prentice Hall of India.
3. K.S. Trivedi - Probability and Statistics with Reliability and Queuing and Computer Science Applications, Prentice Hall of India.

Reference Books

1. John E Hopcroft and Jeffrey D Ullman – Introduction to Automata theory, Languages and Computation – Narosa Publication House, 2004.

MCS-202

Advanced Database Management System

Distributed Database Introduction:

Distributed DBMS features and needs. Reference architecture. Levels of distribution transparency, replication. Distributed database design - fragmentation, allocation criteria.

Query Optimization & Concurrency Control:

Storage mechanisms. Translation of global queries. / Global query optimisation. Query execution and access plan. Concurrency control - 2 phases locks. Distributed deadlocks. Time based and quorum based protocols. Comparison. Reliability- non-blocking commitment protocols.

Introduction of Data Warehousing:

Data warehousing – definitions and characteristics, Multi-dimensional data model, Warehouse schema.

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

Data Marts:

Data marts, types of data marts, loading a data mart, metadata, data model, maintenance, nature of data, software components; external data, reference data, performance issues, monitoring requirements and security in a data mart.

Online Analytical Processing:

OLTP and OLAP systems, Data Modeling, OLAP tools, State of the market, Arbor Essbase web, Microstrategy DSS web, Brio Technology, star schema for multi dimensional view, snowflake schema; OLAP tools.

Developing a Data Warehousing:

Building of a Data Warehousing, Architectural strategies & organizational issues, design considerations, data content, distribution of data, Tools for Data Warehousing.

Data Mining :

Definitions; KDD (Knowledge Discovery database) versus Data Mining; DBMS versus Data Mining, Data Mining Techniques; Issues and challenges

Association Rules :

A priori algorithm, Partition algorithm, Dynamic inset counting algorithm, FP – tree growth algorithm; Generalized association rule.

Clustering Techniques :

Clustering paradigm, Partition algorithms, CLARA, CLARANS; Hierarchical clustering, DBSCAN; Categorical clustering, STIRR, ROCK, CACTUS.

Decision Trees :

Tree construction principle, Best split, Splitting indices, Splitting criteria, Decision tree construction with presorting.

Web Mining:

Web content Mining, Web structure Mining, Web usage Mining, Text Mining.

Temporal Data mining:

Basic concepts of temporal data Mining, The GSP algorithm.

Reference:

- [1] Prabhu, Data Warehousing –Concepts, Techniques, Products, Application; [PHI.]
- [2] A. K. Pujari, Data Mining Techniques; [Universities Press.]
- [3] Alex Berson and Stephen J Smith, Data Warehousing, Data Mining and OLAP; [TMH.]
- [4] Anahory, Data Warehousing in the real world; [Pearson Education.]
- [5] Silberschatz Korth, Sudarshan, Database System Concepts, [MH]
- [6] Tannenbaum, Distributed Database, [Pearson]

MCS-203

Distributed Computer Systems

Introduction to Open Distributed Computing :

Motivation, Characteristics, Design goals of distributed systems, distribution data and control, clock synchronization, distributed termination problem, load distribution, deadlocks in distributed systems, fault tolerant computing , high level language supports for distributed computing, tools for developing distributed applications, issues in the design of distributed information systems, case study of some distributed systems – Amoeba, Mach..

Communication paradigm :

Message passing based communication primitives, atomic actions, basic issues in remote procedure call mechanism, parameter marshalling, stub generation, semantics in presence of failures, orphan handling etc., distributed object based programming paradigms, group communication.

Distributed Shared Memory:

Types of shared memory multiprocessors, Consistency models, Page based distributed shared memory, Shared variable distributed shared memory, Object based distributed shared memory

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

Distributed file system :

Issues such as naming, protection, semantics of file- sharing, cache coherence, etc.

Case studies of SUN – NFS.

Client/server computing :

Client/server building blocks- client/server infrastructure, choice of client OS or server OS.

Reference:

1. *Distributed Systems – Coulouris [Pearson Education]*
2. *Distributed Operating Systems- Tannenbaum [Pearson Education]*
3. *Distributed Systems : Principles and Paradigms – Tannenbaum [Pearson Education]*

MCS-204A

VLSI SYSTEM DESIGN

Overview of VLSI system design,

MOS devices & circuits-physics of MOS transistors,

NMOS, CMOS, MOS fabrication and scaling.

Delay and power consumption - driving high capacitive loads, super buffers.

Inverters, logic gates - design rules and layouts, stick diagram transistor sizing.

Logic design – static NMOS and CMOS combinational networks, steering logic.

Dynamic CMOS and clocking - static vs. dynamic CMOS design, domino CMOS structures, charge sharing, clock generation and distribution.

MOS memory devices.

Special circuit layouts - Multiplexers, general purpose functional blocks, barrel shifter etc.

VLSI design phases, Data Structures used in Physical design phase, Physical design phase

partitioning, placement, floor planning, routing, VLSI testing principles, design rule checking,

circuit extraction and simulation modelling and simulation of MOS circuits using psplce.

Reference:

1. *Introduction to VLSI Design- Meal & Carway*
2. *Introduction to VLSI Physical Design - N. Sherwani*
3. *VLSI Design – Pucknell*
4. *Modern VLSI Design - Wayes & Wolf, - Silicon Publisher*

MCS-204B

Real Time & Embedded System

Introduction (Defining real time systems, Embedded real time systems, Special characteristics of real time systems, a brief evolutionary history).

Hardware architecture of real time systems.

Software architecture (Concepts interrupt driven activation, need for real time monitor, pseudo parallelism).

Hardware Software Co-design.

Data Flow in Embedded Systems

Embedded System Development Life Cycle

Embedded System Design Issues:

- (a) Hardware Issues:
 - (i) Processor
 - (ii) Memory
 - (iii) Peripherals

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

- (b) Software Issues:
 - (i) Programming Languages
 - (ii) Time Criticality
 - (iii) RTOS

Testing:

1. Testing Phases:
 - (a) Software
 - (i) Module Testing
 - (ii) Functional Testing using Simulation Tools
 - (b) Hardware:
 - (i) Board Level Testing
2. Testing Tools:
 - (a) Software Tools:
 - (i) Simulator
 - (ii) GUI Tester
 - (iii) Debugger
 - (iv) JTAG based Debuggers
 - (v) Performance Analysis Tools
 - (b) Hardware Tools:
 - i) CRO
 - ii) In Circuit Emulator
 - iii) Logic State Analyser

Reconfigurable Computing:

- (i) PLD Architecture and programming
- (ii) FPGA Architecture
- (iii) Reconfigurable Architecture using FPGA (Applications: DSP, Image Processing, etc.)
- (iv) Parallel Architecture using FPGA.

Books:

1. An Embedded Software Primer – Simon – Pearson Education
2. Embedded Systems _ Raj Kamal – TMH
3. Introduction to Real time Imaging – Laplante – PHI

MCS-204C

Cellular Automata & Its Applications

Introduction to Cellular Automata (CA), Computing model, Neighborhood and radius, Moore and Von Neumann Architecture, advantages over conventional machine.

Structure of CA – one, two, multi dimensional, their neighborhood, rule of CA, Different classes of CA – class I, II, III, IV, Difference between order, complex, chaos, Types of CA – linear, non-linear, multi-valued, probabilistic, fuzzy.

Linear CA – characteristic polynomial, matrix algebra, analysis and synthesis, Quasi linear CA, Nonlinear CA – characterization, synthesis, and analysis of probabilistic, fuzzy, multi-valued CA.

Relation of CA with vector space, field, Galois field, concept of Hierarchical CA, concept of GF(2) and GF(2^p) CA

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

Cellular automata and evolutionary algorithm, Genetic Algorithm (GA), concept of CAGA, parallel GA, co-evolution, Embedded GA.

Application of CA in VLSI, compression, authentication, design and test, signature analysis, error correcting code, pattern recognition, encryption

Reference:

1. J. Von. Neumann, The theory of self-reproducing automata.
2. P Pal Chaudhuri et. al, Additive Cellular Automata: Theory and Application.
3. S. Wolfram, A New Kind of Science.
4. M. Mitchell, Genetic Algorithm.
5. C. Moore, Quasi Linear Cellular Automata
6. Journals of IEEE Transactions (www.ieee.org/ieeexplore)

MCS-204D

AI & Neural Network

Overview of Artificial intelligence:

Problems of AI, AI technique, Tic – Tac – Toe problem. Problems, Problem Space & search. Heuristic Search Techniques, Knowledge representation issues. Representing knowledge using rules. Symbolic reasoning under uncertainty. Statistical reasoning.

Learning – induction & explanation based learning.

Basic concepts of neurocomputing:

Artificial Neural Networks (ANN) and their biological roots and motivations. ANNs as numerical data/signal/image processing devices. Encoding (training phase) and decoding (active phase). Taxonomy of neural networks: feedforward and recurrent networks with supervised and unsupervised learning laws. Static and dynamic processing systems. Basic data structures: mapping of vector spaces, clusters, principal components.

Basic terminology related to an artificial neuron:

A summing dendrite, synapses and their weights, pre- and post-synaptic signals, activation potential and activation function. Excitatory and inhibitory synapses. The biasing input. Types of activating functions.

The Perceptron

The Perceptron and its learning law. Classification of linearly separable patterns.

Linear Networks.

Adaline --- the adaptive linear element. Linear regression. The Wiener-Hopf equation. The Least-Mean-Square (Widrow-Hoff) learning algorithm. Method of steepest descent. Adaline as a linear adaptive filter. A sequential regression algorithm.

Multi-Layer Feedforward Neural Networks:

aka Multi-Layer Perceptrons. Supervised Learning. Approximation and interpolation of functions. Radial-Basis functions. Back-Propagation Learning law. Fast training algorithms. Applications of multilayer perceptrons: Image coding, Paint-quality inspection, Ntalk.

Self-Organising systems.

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

Unsupervised Learning. Local learning laws. Generalised Hebbian Algorithm. The Oja's and Sanger's rules.
Principal component analysis --- Karhunen-Loeve transform.

Competitive Learning:

MinNet and MaxNet networks. Clustering. Learning Vector Quantisation. Codebooks. Application in data compression.

Self-Organising Feature Maps:

Kohonen networks.

References:

- *Simon Haykin, Neural Networks -- a Comprehensive Foundation, Prentice Hall, 2nd ed., 1999, ISBN 0-13-273350-1*
- *Andrew P. Paplinski,*
- *H. Demuth, M. Beale, For use with MATLAB. User's Guide The MathWorks Inc, (Huge file!)*
- *For use with MATLAB. User's Guide The MathWorks Inc, (Huge file!)*
- *Martin T. Hagan., H. Demuth, M. Beale, Neural Network Design, PWS Publishing, 1996, ISBN 0-534-94332-2*
- *A. Konar, Computational Intelligence Principles, Techniques and Applications. Springer, 2005, ISBN: 3-540-20898-4*
- *W. S. Sarle, editor.*

MCS-205A

Object Oriented Information System Design

The Object-Oriented paradigm, Basic concepts of classes, objects, attributes, operations, methods, services and message passing. Notation of abstraction, encapsulation/information hiding and modularity, instantiation and initialization of objects. Inheritance association, aggregation and composition. Object-Oriented Software life cycle, Object-Oriented analysis, Domain analysis, Generic components of the OO analysis model, The OOA process, Design for Object Oriented Systems, Design Patterns. UML(Universal Modeling Language): class and object diagrams, State chart Diagram, Component Diagram. OMT, Coad and Yourdon approach , Booch Method.

OMT analysis and modeling methods, System Design, Object Design, Translating design to implementation. Object Technology for Distributed Application, Concept of OO Database Design. Object Oriented Testing, Object Oriented Project Management.

References:

1. *Rambaugh, James, Michael " Object Oriented Modeling and Design" PHI.*
2. *Dillon T and Lee Tam Poh " Object Oriented Conceptual Modeling" PHI.*
3. *Eddon Gut and Eddon Henry " Inside Distributed COM"*

MCS-205B

Enterprise Computing Methodologies

1. Introduction to Contemporary Information Systems
 - i. Enterprise Resource Planning (ERP)
 - ii. Customer Relationship Management (CRM)

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

- iii. Supply Chain Management (SCM)
- iv. Application Service Provider (ASP)

- 2. Review of Information Systems in an Organization
 - i. Functional Areas of Business
 - ii. Business Processes

- 3. The Development of Enterprise Resource Planning Systems
 - i. Manufacturing Roots of ERP
 - ii. ERP Software: SAP

- 4. Marketing Information Systems

- 5. Production and Materials Management Information Systems

- 6. Accounting and Finance

- 7. Human Resources: PeopleSoft

- 8. ERP and the World Wide Web
 - i. Business Solutions
 - ii. E-Commerce

- 9. Advanced Computer Business Modeling Techniques.
 - i. Spreadsheet Modeling
 - ii. Database Modeling

Reference:

- [1] *Concepts in Enterprise Resource Planning* by Brady, Monk and Wagner, Course Technology, A division of Thomson Learning, 2001
- [2] *Advanced Cases in MIS* by Brady, & Monk, Course Technology, A division of Thomson Learning, 2000

MCS-205C

Multimedia Technology

Introduction:

Motivation, evolution of multimedia, structure and components of multimedia, application domain, Internet and multimedia, hypertext, hypermedia, browser and helper application overview, user interface design issues.

Sound and Audio Technology:

Psychoacoustics: frequency and amplitude sensitivity of hearing, music and noise, stereo effects, masking; Frequency domain compression of analog signal, digitization of audio signal: sampling and coding, digital audio signal processing, architecture of sound card, electronic music and synthesizer, MIDI: Interface, protocol and data format.

Image and Graphics:

Principles of raster graphics: visual display concept, resolution, colors and pallets, refresh rate and graphics accelerators; digital image representation and format, graphic drafting tools, image enhancement, color printer principles, image scanner principles, digital still camera principles, file formats.

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

Video Technology:

Analog video principles and broadcast standards, CCD Camera, recording formats and standard; digital video principles, TV cards, frame grabber principles, IDTV and HDTV principles

Animation and Special Effects:

History of animation, animation principles, animation techniques, shockwave animation, survey of animation tools and file formats, special visual effects.

Storage Media:

Magnetic media principles and storage density, principles of CD technology: CDRom, CDRW and CD-DA format and principles, IDE, SCSI and USB interfaces to storage devices.

Data Compression:

Information theory based and frequency domain based compression, basic compression techniques (DPCM, RLE, Huffman Coding etc), JPEG/ISO, H261, H263, MPEG-1,2,4,7, DVI.

Multimedia Document Interchange Formats:

Hypertext, HTML, MHEG, SGML, Open Document Architecture, Open Media Framework.

Authoring Tools and Metaphors:

Authoring tools: Productivity and Creativity, survey of authoring tools: book metaphor, slideshow metaphor, time-line metaphor, network and icon metaphor.

Reference:

- [1] P.K. Andleigh and K. Thakrar, *Multimedia System Design*, [PHI]
- [2] R. Steinmetz and K. Nashtedt, *Multimedia Computing, Communication & Applications*, [PHI]
- [3] F. Hulshall, *Multimedia Communication*, [Pearson Ed.]
- [4] J.F.K. Buford, *Multimedia System*, [Pearson Ed.]
- [5] S. Fisher, *Multimedia Authoring: Building and Developing Documents*, [AP Professional]

MCS-205D

Digital Signal Processing

Discrete time signals and systems:

LT1 systems, Properties of LT1 systems, Linear constant differences equations, Frequency domain representation of discrete time signals.

Review of Z-transforms, its properties and its application to DSP.

Discrete Time Fourier Transform (DTFT):

Discrete Fourier Transforms (DFT) and DCT techniques, Fast Fourier Transforms,

Discrete Convolutions and Correlation.

Filter Design Techniques:

IIR and FIR filters, Finite word length effects.

Multi-rate digital signal processing Concepts and Importance, Hilbert transform Techniques.

Realization of LT1 systems- Canonic forms, including ladder realizations etc.

2D-Signal processing and its applications, Introduction to Multi Filters and applications.

Reference Books

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

1. Alan V Oppenheim , Ronald .W.Schafer with J.R. Buch, "Discrete Signal Processing" –Prentice-Hall , India.
2. J.G.Prokakis and D.G.Manolaki's, "Digital Signal Processing –Principles, Algorithms and Applications", Prentice-Hall of India Pvt. Ltd. , 1996.
3. Emmamuel c. Ifeacher, "Digital Signal Processing (A Practical approach)", Addison-wesley Publishing Company, 1993.
4. S.K. Mitra , "DSP- System Approach", Tata Mc-Graw Hill.
5. J.S.Lim, "2D Signal and Image Processing", Prentice Hall.
6. R.E.Crochiere Rabiner , "Multirate DSP" Prentice-Hall.

MCS-301A

Digital Image Processing and Pattern Recognition

Introduction

Digital Image processing, Origins of DIP, Examples, Fundamental steps in DIP, Components of DIP

Fundamentals

Elements of visual perception, Light and the electro magnetic spectrum, Image Sensing and acquisition, Image sampling and quantization, basic relationships between pixels

Image Enhancement

Background, some basic gray level transformation, Histogram processing, enhancement using arithmetic /Logic operation, Basics of Spatial filtering, smoothing spatial filters, sharpening spatial filters

Image enhancement

Background , Introduction to the Fourier transform and the frequency domain, smoothing frequency-domain filters, sharpening frequency domain filters, homomorphic filters & implementation

Image restoration

Noise models, restoration in the presence of noise only – spatial filtering, Periodic noise reduction by frequency domain filtering. Inverse filtering

Image compression

Fundamentals. Image compression models, error free compression, lossy compression

Pattern Recognition

Introduction, Probability, Statistical decision making, Nonparametric decision making, Clustering, Processing of waveforms, Image analysis.

Reference:

[1] *Digital Image Processing, Woods & Gangzlez*

[2] *Pattern Recognition, Pau & Gonzalez.*

MCS-301B

Bio-informatics

Introduction to Molecular Biology:

DNA, RNA and protein concept, gene expression, gene regulatory network.

Introduction to Bio-informatics:

Definition, Classification – Data Storage and Maintenance, data analysis.

Data Storage and Maintenance:

Different Databases for Gene sequence and protein sequence data, different databases for Gene expression data.

Data Analysis:

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

Genomics:

Structural Genomics – Gene sequence analysis, different sequence alignment algorithm for predicting open reading frame from DNA sequence, Identification of transcription factors.

Functional Genomics – Introduction to Gene expression data, CDNA and affimatrix technique for generating Gene expression data, Gene expression data clustering techniques – Agglomerative, Diana, K-Mins, K-midoid, Graph partitioned based clustering algorithms, FUZZY clustering algorithms, Gene regulatory network discovering techniques – Baysean Net, Neural Net base techniques

Proteomics:

Protein sequence data analysis data analysis, finding secondary and tertiary structures from protein sequence data, prediction of protein functionality from protein sequence.

Reference:

[1] Bio-informatics Computing, Bryan Bergeron

MCS-301C

Soft Computing

Artificial Neural Network

Basic concept of Soft Computing; Basic concept of neural networks, Mathematical model, Properties of neural network, Typical architectures: single layer, multilayer, competitive layer; Different learning methods: Supervised, Unsupervised & reinforced; Common activation functions; Feed forward, Feedback & recurrent N.N; Application of N.N; Neuron.

Pattern Recognition

Pattern Classification, Pattern Association, Clustering, Simple Clustering algorithm, k-means & k-medoid based algorithm.

Models Of Neural Network

Architecture, Algorithm & Application of -- McCulloh-Pitts, Hebb Net, Perceptron (with limitations & Perceptron learning rule Convergence theorem), Backpropagation NN, ADALINE, MADALINE, Discrete Hopfield net, BAM, Maxnet , Kohonen Self Organizing Maps, ART1,ART2.

Fuzzy Sets & Logic

Fuzzy versus Crisp; Fuzzy sets—membership function, linguistic variable, basic operators, properties; Fuzzy relations—Cartesian product, Operations on relations; Crisp logic—Laws of propositional logic, Inference; Predicate logic—Interpretations, Inference; Fuzzy logic—Quantifiers, Inference; Fuzzy Rule based system; Defuzzification methods; FAM;

Genetic Algorithm

Basic concept; role of GA in optimization, Fitness function, Selection of initial population, Cross over(different types), Mutation, Inversion, Deletion, Constraints Handling; Evolutionary Computation; Genetic Programming; Schema theorem; Multiobjective & Multimodal optimization in GA; Application— Travelling Salesman Problem, Graph Coloring problem;

Hybrid Systems

Hybrid systems, GA based BPNN(Weight determination, Application); Neuro Fuzzy Systems—Fuzzy BPNN--fuzzy Neuron, architecture, learning, application; Fuzzy Logic controlled G.A;

Books:

1. Neural Networks- A Comprehensive foundation, Simon Haykin, 2nd Ed; Pearson
2. Neural Networks, Fuzzy Logic & Genetic Algorithms – Synthesis & applications, T.S. Rajasekaran & G.A. Vijaylakshmi Pai, PHI
3. Genetic Algorithm & fuzzy Logic Systems - Sanchez, Takanori, Zadeh; World Scientific
4. Genetic Algorithm, Goldberg David E.; Pearson
5. Fuzzy Set Theory & Its Applications - Zimmermann H. J.; Allied Publishers Ltd.

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

6. Fundamentals of Neural Networks, architectures, algorithms & applications --- Laurence Fausett; Prentice Hall, Englewood Cliffs.
7. Fuzzy Sets & Fuzzy Logic, Klir & Yuan, PHI.

MCS-301D

Courseware Engineering

Approaches to Instruction Design:

Introduction of four level of Instruction Design: Instruction Design Process, stages, procedure and tools, training content, comparison of levels instructional design, products and tools, population analysis, distinction between skill & knowledge, structuring skill & knowledge, expositive and experiential strategies, comparison, planning the tactics for the teaching of knowledge, strategies & tactics for teaching of skill, lesson tactics for the knowledge content.

Organizing Courseware:

Overview of instructional courseware, classification of learning, category of courseware, engineering design characteristics, the pragmatic model, functional steps to prepare a courseware, traditional ideas for educational activities, content structure and layout, important factors for the real worth use of the courseware method of education, free running video, organizing instruction CBT.

Evaluation Design:

Nature & needs of evaluation, function of evaluation, principles of evaluation, steps of evaluation, aims of evaluation, types of evaluation, evaluation tools, evaluation methods.

Courseware Life Cycle and Quality Analysis:

Introduction, courseware life cycle model, courseware development life cycle and methods, seven different aspects of development cycle, factors affecting the design, ADDIE model, analysis phase, learner performance model, design ,development, implementation & evaluation phase, quality assurance, cost estimation, courseware testing.

MCS-302A

Advanced Microprocessors

Processor Design:

The evolution of microprocessors, instruction set processor design, principles of processor performance, instruction-level parallel processing, conventional CISC & RISC architecture.

Pipelined Processors Design:

Pipelining fundamentals, Pipeline hazards & pipelined processor design using hazard resolution techniques.

Super Scalar Processor:

Limitation of scalar pipelining, from scalar to super scalar pipelines, super scalar pipeline overview, super scalar techniques: instruction flow techniques, register data flow techniques, memory data flow techniques.

The Power PC 6 20:

Introduction, instruction fetching, instruction dispatching, instruction execution, instruction completion.

Intel's P6 Micro-architecture:

Introduction, pipelining, the in-order front end, the out-of-order core, retirement, memory subsystem

The VLIW Architecture:

Basic principles, overview of proposed and commercial VLIW architecture, case study: the trace 200 family.

Advanced Instruction flow techniques:

Static Branch prediction, Dynamic Branch prediction, Hybrid Branch prediction

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

Advanced Register Data flow techniques:

Value locality & Redundant execution, Value locality without speculation, Value locality with speculation.

Execution of multiple threads:

Synchronising Shared memory threads, Explicitly multithreaded processors, Implicitly multithreaded processors.

Advanced Memory Technology:

SRAM, SDRAM, flash memory, dual port memory, cache memory, interleaved memory.

Microprocessor Based Applications:

Case studies.

Reference:

[1] *Modern Processor Design – Shen & Lipasti [TMH]*

[2] *Advance Microprocessor - Rafiquzzaman [PHI]*

[3] *The Pentium Microprocessor – Antonakos [Pearson]*

[4] *An Introduction to Intel Family of Microprocessors - Antonakos [Pearson]*

[5] *Microprocessor: Principles and Applications - Gillmore [TMH]*

MCS-302B

Parallel computing

1. Parallel programming models

- a. Shared variable Model
- b. Message passing model
- c. Data parallel model
- d. Object oriented model
- e. Functional & logic model

2. Dependence analysis of data arrays

- a. Iteration space & dependence analysis
- b. Subscript separability & partitioning
- c. Categorized dependence tests

3. Parallel program development & environments

- a. Parallel programming environment
- b. Shared variable program structures
- c. Message passing program development
- d. Mapping algorithms onto parallel computers
- e. Synchronisation & multiprocessing models

4. Analysis of parallel algorithms

- a. Complexity analysis of parallel algorithms (searching , sorting , merging , selection, etc) on different types of architecture.
- b. Latency , communication costs & other performance issues.

Case studies on FFT, matrix multiplication, SVD, etc.

Reference:

[1] Quinn, Parallel Computing [TMH]

[2] Sashi Kumar, Introduction to Parallel Processing [PHI]

[3] Wilkinson, Parallel Programming [Pearson]

[4] Hwang, Advanced Computer Architecture [TMH]

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

MCS-302C

Compiler Construction

1. Introduction to Compilers, Overview of Compilers

Why Compilers? A Brief History, Program Related to Compilers, The Translation Process, Major data structures in a Compiler, Other issues in compiler structure, Bootstrapping & Porting, Compiler Construction Tools

2. Lexical Analysis

The role of the Lexical analyzer, The scanning process, Regular expressions, finite Automata, From Regular expressions to DFA's , Design of a Lexical Analyzer generator, Use of Lex to generate a Scanner Automatically

3. Syntax Analysis

The role of the parser, The parsing process, Context- free grammars, Parse Tree & Abstract Syntax Trees, Ambiguity, External Notations, EBNF & Syntax diagrams, Formal properties of Context-free Languages, The Parser Generator

4. Top- Down Parsing

Top –Down parsing by Recursive – Descent, LL(1) parsing, First & Follow sets, Error – Recovery in Top-Down Parsers

5. Bottom – Up Parsing

Overview of Bottom – Up parsing, Finite Automata of LR(0) Items & LR(0) Parsing, SLR(1) Parsing, General LR(1) and LALR(1) Parsing, YACC: An LALR(1) Parser Generator, Error Recovery in Bottom-Up Parser

6. Semantic Analysis

Attributes and Attribute Grammars, Algorithms for Attribute Computation, The Symbol Table, Data Types checking

7. Intermediate Code Generation

Intermediate Languages, Intermediate Code & Data Structures for code generation, Basic code generation techniques, code generation of data structure references, code generation of control statements & logical expressions, code generation of procedures & function calls

8. Run Time Environment

Memory organization During Program Execution, Fully Static Run Time Environments, Stack-Based Runtime Environments, Dynamic memory, Parameter Passing Mechanisms

9. Code Optimization

Introduction, The Principal sources of optimization, Optimization of basic blocks, code improving Transformations

Reference:

- [1] *Compiler Construction Principles & Practice* By Kenneth C. Loudon, International Student Edition, 2003, [Vikas Publishing]
- [2] *Compilers Principles Techniques & Tools* By A. V. Aho, Ravi Sethi & J. D. Ullman, [Addison Wesley 4th Edition, 2000]
- [3] *Engineering a compiler* by Keith, D. Cooper & Linda Torezon, [Morgan Kaufmann publishers, first Indian reprint 2004]
- [4] *The essence of compilers* by Robin Hunter, Pearson education, First Indian reprint 2004.

MCS-302D

Cryptography and Computer Security

1. Foundations of Cryptography and Security

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

1. Ciphers and Secret Messages
2. Security Attacks and Services
2. Mathematical Tools for Cryptography
 1. Substitutions and Permutations
 2. Modular Arithmetic, Euclid's Algorithm
 3. Finite Fields, Polynomial Arithmetic
 4. Discrete Logarithms
3. Conventional Symmetric Encryption Algorithms
 1. Theory of Block Cipher Design
 2. Feistel Cipher Network Structures
 3. DES and Triple DES
 4. Modes of Operation (ECB,CBC, OFB,CFB)
 5. Strength (or Not) of DES
4. Modern Symmetric Encryption Algorithms
 1. IDEA, CAST, Blowfish, Twofish
 2. RC2, RC5, Rijndael (AES)
 3. Key Distribution
5. Stream Ciphers and Pseudo Random Numbers
 1. Pseudo random sequences
 2. Linear Congruential Generators
 3. Cryptographic Generators
 4. Design of Stream Cipher, One Time Pad
6. Public Key Cryptography
 1. Prime Numbers and Testing for Primality
 2. Factoring Large Numbers
 3. RSA, Diffie-Hellman, ElGamal
 4. Key Exchange Algorithms
 5. Public-Key Cryptography Standards
7. Hashes and Message Digests
 1. Message Authentication
 2. MD5, SHA, RIPEMD, HMAC
8. Digital Signatures, Certificates, User Authentication
 1. Digital Signature Standard (DSS and DSA)
 2. Security Handshake Pitfalls
 3. Elliptic Curve Cryptosystems
9. Authentication of Systems
 1. Kerberos V4 and V5
 2. X.509 Authentication Service
10. Electronic Mail Security
 1. Pretty Good Privacy (PGP)
 2. S/MIME, X.400
11. IP and Web Security
 1. IPSec and Virtual Private Networks
 2. Secure Sockets and Transport Layer (SSL and TLS)
12. Electronic Commerce Security
 1. Electronic Payment Systems
 2. Secure Electronic Transaction (SET)
 3. CyberCash, iKey Protocols, Ecash (DigiCash)
13. Digital Watermarking and Steganography

References:

- 1) Wenbo Mao, Modern Cryptography: Theory and Practice, Prentice Hall, 2004
- 2) William Stallings, Cryptography and Network Security, 3Ed, Prentice Hall PTR, 2003

Syllabus for
M. Tech.(Computer Science & Engineering)
(Offered by Netaji Subhash Engineering College under West Bengal University of
Technology)

- 3) Richard A. Mollin, An Introduction to Cryptography, Chapman and Hall/CRC, 2001.
- 4) B. Schneier, Applied Cryptography, John Wiley and Sons, NY, 1996.
- 5) A. Menezes, P. Oorschot, and S. Vanstone, Handbook of Applied Cryptography, CRC Press, Boca Raton, FL, 1997.
- 6) Thomas H. Barr, Invitation to Cryptography, Prentice Hall, 2002.
- 7) Richard J. Spillman, Classical and Contemporary Cryptology, Prentice Hall, 2005.
- 8) D.Stinson, Cryptography: Theory and Practice, Second Edition (ISBN: 1584882069) Chapman & Hall; 2002.
- 9) Dorothy E. Denning Information Warfare and Security , Addison Wesley 1999

Laboratories:

MCS-111: Data Structures & Algorithm Laboratory

Assignments will be set conforming with the syllabus of MCS-102

MCS-112: Networks & System Programming Laboratory

Assignments will be set conforming with the syllabus of MCS-103
And Networks Socket programming.

MCS-211: Advanced Data Base Management System

Assignments will be set conforming with the syllabus of MCS-202

MCS-212 : Programming Laboratory – I:

Practical assignments will be allocated as per the Elective-III chosen by a student conforming with the syllabus of the particular Elective.

MCS-311 : Programming Laboratory – II:

Practical assignments will be allocated as per the Elective-V chosen by a student conforming with the syllabus of the particular Elective.