

M. Tech. - Computer Science & Engineering - Full Time – 2007

Course Code	Course Title	L	T	P	C
Semester – I – Theory					
MMA603	Mathematical Foundation for Computer Science	3	1	0	4
MCS601	Computer Architecture	3	1	0	4
MCS603	Operating Systems	3	0	0	3
MCS605	Data Structures and Algorithms	3	0	0	3
MCS607	Microprocessor Based System Design	3	1	0	4
MCSE01/ MCSE03/ MCSE05/ MCSE07	Elective – I	3	0(1)	0	3(1)
Practical					
MCS691	Computer Lab 1 (OS and Data Structures Lab)	0	0	6	2

Credits 23(1)

MMA603 is the equivalent of MMA103 offered as per the previous syllabus
MCS601 is the equivalent of MCS102 offered as per the previous syllabus
MCS603 is the equivalent of MCS103 offered as per the previous syllabus
MCS605 is the equivalent of MCS104 offered as per the previous syllabus
MCS607 is the equivalent of MCS105 offered as per the previous syllabus
MCS691 is the equivalent of MCS191 offered as per the previous syllabus

Semester – II – Theory					
MCS602	Compiler Design	3	1	0	4
MCS604	Database Technology	3	0	0	3
MMG632	Engineering Management	3	0	0	3
MCSE02/ MCSE04/ MCSE06/ MCSE08	Elective II	3	0(1)	0	3(1)
MCSE10/ MCSE12/ MCSE14/ MCSE16	Elective III	3	0(1)	0	3(1)
MCS694	Term Paper & Seminar	0	0	6	2
Practical					
MCS692	Computer Lab 2 (System Software and DBMS Lab)	0	0	6	2
MCS696	Industrial Training/ Interdepartmental Project	0	0	3	1

Sub Total

Credits: 21(2)

MCS602 is the equivalent of MCS107 offered as per the previous syllabus
MCS604 is the equivalent of MCS104 offered as per the previous syllabus
MMG632 is the equivalent of MMG131 offered as per the previous syllabus
MCS694 is the equivalent of MCS194 offered as per the previous syllabus
MCS692 is the equivalent of MCS192 offered as per the previous syllabus
MCS696 is the equivalent of MCS196 offered as per the previous syllabus

Semester – III – Theory					
MCS701	Software Engineering	3	1	0	4
MCS703	Computer Networks	3	0	0	3
MCSE09/ MCSE11/ MCSE13/ MCSE15	Elective IV	3	0(1)	0	3(1)
MCSE17/ MCSE19/ MCSE21/ MCSE23/ MCSE25	Elective V	3	0(1)	0	3(1)
Practical					
MCS791	Project Work Phase I	0	0	12	6
Sub Total		20(2)			

MCS701 is the equivalent of MCS201 offered as per the previous syllabus
MCS703 is the equivalent of MCS203 offered as per the previous syllabus
MCS791 is the equivalent of MCS291 offered as per the previous syllabus

Semester – IV – Theory					
MCS792	Project Work Phase II	0	0	24	15
Sub Total		15			

MCS792 is the equivalent of MCS292 offered as per the previous syllabus

Total Credits to be earned for the award of the Degree: 79 (+5)

List of Electives

I ELECTIVE

MCSE01	Object Oriented Analysis and Design	3	0	0	3
MCSE03	Digital Image Processing	3	0	0	3
MCSE05	Agent Based Systems	3	0	0	3
MCSE07	Neural Networks	3	0	0	3

MCSE01 is the equivalent of MCSE15 offered as per the previous syllabus
MCSE03 is the equivalent of MCSE04 offered as per the previous syllabus
MCSE05 is the equivalent of MCSE03 offered as per the previous syllabus
MCSE07 is the equivalent of MCSE05 offered as per the previous syllabus

II ELECTIVE

MCSE02	Multimedia Systems	3	0	0	3
MCSE04	Soft Computing	3	0	0	3
MCSE06	Pattern Recognition	3	0	0	3
MCSE08	Internet Programming	3	1	0	4

MCSE02 is the equivalent of MCSE08 offered as per the previous syllabus
MCSE04 is the equivalent of MCSE02 offered as per the previous syllabus
MCSE06 is the equivalent of MCSE07 offered as per the previous syllabus
MCSE08 is the equivalent of MCSE06 offered as per the previous syllabus

III ELECTIVE

MCSE10	Parallel Computers and Algorithms	3	0	0	3
MCSE12	E-Commerce	3	0	0	3
MCSE14	Data-mining and Data-warehousing	3	0	0	3
MCSE16	Embedded Systems	3	0	0	3

MCSE10 is the equivalent of MCSE12 offered as per the previous syllabus
MCSE12 is the equivalent of MCSE17 offered as per the previous syllabus
MCSE14 is the equivalent of MCSE18 offered as per the previous syllabus
MCSE16 is the equivalent of MCSE16 offered as per the previous syllabus

IV ELECTIVE

MCSE09	Mobile Communication	3	1	0	4
MCSE11	Advanced Web Technology	3	1	0	4
MCSE13	Network Security	3	1	0	4
MCSE15	High Speed Networks	3	1	0	4

MCSE09 is the equivalent of MCSE09 offered as per the previous syllabus
MCSE11 is the equivalent of MCSE10 offered as per the previous syllabus
MCSE13 is the equivalent of MCSE13 offered as per the previous syllabus
MCSE15 is the equivalent of MCSE14 offered as per the previous syllabus

V ELECTIVE

MCSE17	Legacy Systems	3	1	0	4
MCSE19	Distributed Computing	3	0	0	3
MCSE21	Web Services	3	1	0	4
MCSE23	Client-Server Computing	3	0	0	3
MCSE25	Special Elective	3	0	0	3

MCSE17 is the equivalent of MCSE11 offered as per the previous syllabus
MCSE19 is the equivalent of MCSE 01 offered as per the previous syllabus
MCSE21 is the equivalent of MCSE19 offered as per the previous syllabus
MCSE23 is the equivalent of MCSE20 offered as per the previous syllabus
MCSE25 is the equivalent of MCSE25 offered as per the previous syllabus

MMA603 MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE 3 1 0 4

LOGIC 9

Statements - Connectives - Truth Tables - Normal forms - Predicate calculus - Inference - Theory for Statement Calculus and Predicate Calculus - automata theorem proving. SETS Sets - Relations – Graphs – Functions. COMBINATORICS: Review of Permutation and Combination - Mathematical Induction - Pigeonhole principle - Principle of Inclusion and Exclusion - generating function - Recurrence relations

ALGEBRAIC STRUCTURES 9

Semi group - Monoid – Groups (Definition and Examples only) Cyclic group - Permutation group (Sn and Dn) - Substructures - Homomorphism of semi group, monoid and groups - Cosets and Lagrange Theorem – Normal Subgroups - Rings and Fields (Definition and examples only)

RECURSIVE FUNCTIONS 9

recursive functions – primitive recursive functions – computable and non computable functions. LATTICES: Partial order relation – poset – Hasse Diagram – Boolean algebra.

FINITE AUTOMATA AND REGULAR LANGAUGES 9

Finite automata and regular languages-Regular expressions and regular languages-Memory required to recognize a language-Non Determinism and Kleene’s Theorem-Pumping Lemma-Decision Problems

PUSH DOWN AUTOMATA AND CONTEXT FREE LANGUAGES 9

Push down Automata and Context free languages-context free grammars-definition –examples-operations-derivation trees-Ambiguity-PDA and CFG Context free and non –context free languages.

References:

1. J. P. Trembley, Manohar, Discrete Mathematical Structures with Applications to Computer Science, TMH
2. K.H. Rosen, “Discrete Mathematics and its Applications”, McGraw - Hill Book Company, 1999.
3. John. C. Martin, “Introduction to Languages and Theory of Computation”, II edition, McGraw Hill 1997.
4. Hop craft and Ulman ,Introduction to automata, languages and computation,Narosa Publishers 1986.
5. Mott, Kandel & Baker, Discrete Mathematics for Computer Scientists & Mathematics 2nd Edition, PHI 2002

INTRODUCTION6

Overview of CPU, Memory, I/O Design – Introduction to Register transfer notation – abstract and concrete RTN - Performance evaluation.

CPU ARCHITECTURE10

Instruction sets of different machines – CISC and RISC Processors – Simple RISC Computer (SRC) design - Pipelining Issues – Super Scalar Architectures.

MEMORY DESIGN10

Virtual Memory – Cache Design for different architectures and multiprocessor environments – evaluating memory performance.

I/O DESIGN10

Speed Limits – Interfacing to different types of I/O Devices – Performance measures.

PARALLEL ARCHITECTURES9

Data Flow – Vector Processors – Multi Processor Architecture: SIMD, MIMD – Multi Computer Architecture – Interconnection Networks.

- References:
1.

Vincent P. Heuring, Harry F. Jordan, Computer Systems Design and Architecture, Pearson Education 2003.
2.

Stallings, Computer Organization and Architecture: Designing for Performance 6th Edition, PHI
3.

John P. Hayes, “Computer Organization and Architecture”, Tata McGraw Hill 2003
4.

D. A. Patterson & J. L. Hennessy, Computer Architecture – A Quantitative Approach, Morgan Kaufmann Publishers, 2nd edition – 1996.

INTRODUCTION11

Operating Systems Concepts – System Calls – OS Organization – Factors in OS Design – Basic Implementation Considerations – Time Sharing and Multi Programming – Real Time Systems. Process Management: Process Concepts, Model – Process Synchronization – Process Scheduling, Threads. Dead Lock: Detection & Recovery, Avoidance, Prevention- Two Phase Locking Issues.

MEMORY MANAGEMENT9

Basic Memory Management – Swapping – Virtual Memory – Page Replacement Algorithms- Segmentation

FILE SYSTEM AND I/O MANAGEMENT9

Files – Low Level File Implementations – Memory Mapped Files – Directories, Implementation - Principles of I/O Hardware & Software – Device Drivers – Disks Hardware, Formatting & Arm Scheduling Algorithms.

DISTRIBUTED SYSTEMS8

Advantages & Disadvantages of Distributed Systems with Centralized Systems- Hardware & Software concepts – Design Issues – Communications – Client Server Model .

CASE STUDIES8

UNIX, Windows 2000.

- References
1.

Andrew S.Tanenbaum, “Modern Operating Systems”, 2nd edition, Addison Wesley, 2001.
2.

Gary Nutt, “Operating Systems A Modern Perspective “, 2nd edition, Pearson Edn , 2001.
3.

Andrew S.Tanenbaum, “Distributed Operating Systems”, 2nd edition, Pearson Education , 2002
4.

Harvey M.Deitel, “Operating System”, 2nd edition, Addison Wesley, 2000.
5.

Achyut S.Godbole, “Operating systems”, Ninth reprint, TMH, 2001.
6.

Abraham Silberschatz and Peter Galvin, “Operating System Concepts”, Fifth edition, Addison Wesley, 1998.
7.

Charles Crowley, “Operating Systems, TMH, 1998.

LINEAR AND NON-LINEAR DATA STRUCTURES9

Stacks, Queues & Lists Implementation and Applications – Cursor implementation of Linked Lists – Trees – Binary Trees – Binary Search Tree – Tree Traversals – AVL Trees – Splay Trees.

SEARCHING AND SORTING9

Sequential search – Binary search – sorting techniques: Bubble sort, selection sort, insertion sort, heap sort, merge sort, quick sort and radix sort

ALGORITHMS9

Greedy Algorithms – Dynamic Programming – Back tracking – Branch and Bound – Divide and Conquer – Lower Bound Theory.

GRAPH AND PARALLEL ALGORITHMS9

Graphs – representations – traversals: BFS, DFS – minimum spanning tree – shortest path – bi-connected and strongly components – parallel algorithms – sorting – matrix multiplication

SELECTED TOPICS9

NP completeness – approximation algorithms – NP hard problems – magic square.

- References:
1.

E. Horowitz, S. Sahani & Mehta Fundamentals of Data Structures in C++, Galgotia 1999.
2.

Langsman, Augestein & Tanenbaum, Data Structures Using C & C++, 2nd Edition, PHI 2002.
3.

T.H. Cormen, C.E. Leiserson, R.L. Rivest, Introduction to Algorithms, McGraw Hill Book Company, 1994.
4.

Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson Education 2003.
5.

M.J. Quinn, Designing Efficient Algorithms for Parallel Computers, McGraw Hill Book Company, 1998.
6.

Kenneth A. Berman & Jerome L. Paul, Fundamentals of Sequential and Parallel Algorithms, Thomson Learning 2003.

MCS607	MICROPROCESSOR BASED SYSTEM DESIGN	3	1	0	4
ARCHITECTURE AND PROGRAMMING ISSUES OF 8086					9
Intel 8086 architecture – addressing modes – instruction set – format – assembler directives – Assembly language programming					
ARCHITECTURE FEATURES OF ADVANCED PROCESSORS					9
Architectural features of 80286, 80386, 80486, Pentium, Pentium Pro, Celeron, PII, PIII & P4 processors, multimedia extensions – Applications					
CONTROL APPLICATIONS					9
Microprocessors for Control Applications – Micro controller based design of a system – Real time control using micro controllers.					
INTERFACING					9
Interfacing with peripheral devices - Peripheral Controllers – Bus concepts – Bus Standards – Examples – Choosing a bus standard for an application.					
SPECIAL PURPOSE PROCESSORS					9
Introduction to Co-processors, DSP Processors, Graphic Processors and their applications					
References:					
1. Barry B. Brey, The Intel Microprocessors 8086/8088, 80186/80188, 80286, 386, 486 Pentium, Pentium Pro, Pentium II, PIII, P4: Architecture Programming and Interfacing 6 th Edition, Pearson Education, 2003.					
2. Microprocessors and Micro Computer Based System Design, Mohammed Rafiquzzaman, PHI 2003.					
3. Liu & Gibson Microcomputer Systems: The 8086/88 Family: Architecture, Programming & Design 2 nd Edition PHI 2002.					
4. The 8086 /8088 family : Design Programming and interfacing , Uffenback , PHI 2002.					
5. The 8088 and 8086 microprocessor :Programming ,Interfacing , Software , Hardware and Applications. Triebel &Singh ,PHI 2002					

MCS602	COMPILER DESIGN	3	1	0	4
INTRODUCTION					6
Compilers-Grammars-Languages-Phases of compiler-compiler writing tools-Errors-Lexical phase errors, syntactic phase errors, semantic phase errors					
LEXICAL ANALYZER					10
Role of lexical analyzer-input Buffering –Specification and Recognition of tokens –Language for specifying Lexical analyzer-Finite Automata-Regular expression to NFA-Optimization of DFA based pattern matches –Design of a Lexical Analyzer Generator					
SYNTAX ANALYZER					10
Parsers-CFG-derivations and parse trees-capabilities of CFG- Top own parsing-Bottom Up parsing - LR parsing- SLR parsing -LALR parsing – CLR parsing – Operator Precedence – Predictive Parsing.					
INTERMEDIATE CODE GENERATION					10
Syntax Directed Translation scheme-Implementation of Syntax Directed Translators-Intermediate code- postfix notation, parse trees and syntax trees-Trees three address code –Quadruples, Triples –Translation of Assignment statements –Boolean expressions-Declaration –Flow control statements –Back patching.					
CODE OPTIMIZATION					9
Principal source of optimization-Issues in the design of a code generator-Run-Time storage management –Basic blocks and flow graphs Next use information-Simple code generator –DAG representation of basic blocks-Peephole optimization – Code Generation					
References:					
1. A.V.Aho, Ravi Sethi,J. D.ullman, Compilers –principles ,Techniques and tools, Addison Wesley publishing company,1988.					
2. Allen I.Holub, compiler Design in C, Prentice Hall of India, 1993.					
3. Kenneth C. Louden, Compiler Construction: Principles & Practice, Thomson Learning 2003					
4. Muchnick, Advanced Compiler Design: Implementation, Academic Press.					
5. Rajini Jindal , Compilers Construction & Design , Umesh Publications , Delhi.2002					
6. Ronald Mak ,Writing Compilers and Interpreters, 2 nd Edition , John Miler &Sons , 1996 .					

MCS604	DATABASE TECHNOLOGY	3	0	0	3
INTRODUCTION TO DATABASE					9
Database Environment – Data Models – Relational Model – Relational algebra and Calculus – SQL: Data Definition, Data Manipulation, Query by Example – Commercial Databases: PL/SQL – Stored Procedure.					
DATABASE PLANNING					9
Design and Administration – Fact Finding Techniques – ER Modeling – Enhanced ER Modeling – Normalization					
SECURITY					9
Transaction Management – Query Processing – Programmatic SQL – Distributed DBMS: Introduction, Architecture, Design and Advanced Concepts – Query Processing – Updating Distributed Data – Distributed Transaction Management, Concurrency Control – Recovery.					
INTRODUCTION TO OBJECT DBMS					9
Concepts – Design – Standards and Systems – Object relational DBMS – OODBMS.					
DBMS IN WEB APPLICATIONS					9
Structured and Semi Structured Data: XML and DBMS – Overview: of Data Warehousing– OLAP – Data Mining.					
References					
1. Thomas M Connolly, Carolyn E Begg, Database Systems 3/e, A Practical Approach to Design Implementation and Management, Addison Wesley.					
2. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publications 2001.					
3. C. J. Date, An Introduction to Database Systems 7/e, Pearson Education.					
4. Abraham Silberschatz, Henry F Korth, S.Sudershan Database System Concepts Fourth Ed.					

5.	Prabhu, Object Oriented Database Systems: Approaches and Architecture, PHI 2002.				
6.	Morrison, Database Driven Websites, Thomson Learning 2003.				
MMG632	ENGINEERING MANAGEMENT	3	0	0	3
Operating Management					9
Operations Management-Definition and concepts-Quality circles-Suggestion scheme for Quality improvement-Total Quality Management Concept-ISO Quality Certifications and types-Quality assurance-Quality Audit-JIT, Six Sigma Concept, Quality function deployment.					
Marketing					9
Basic Concepts of Marketing-Marketing mix-new product development (Concepts & cases).Relationship marketing, supply chain management. Product life cycle-concepts of service marketing, global marketing concepts.					
Finance					9
Basic concepts of finance-Project finance-Long term finance-Short term finance-working capital management-International finance-GDR-Financial forecasting-Leverage-(operating, Financial & Combined Leverages)					
Managerial Effectiveness & Leadership					9
Measuring Managerial Effectiveness-Organizational Climate-Leadership Styles-Group Influences-Team building-Organizational and Managerial Efforts-Self Development-Negotiation Skills-Development of the Competitive Spirit-Knowledge Management –Fostering Creativity.(Case Study)					
Entrepreneurship Development					9
Entrepreneurship concept- Entrepreneurship as a career- Entrepreneurship-personality Characteristics of Successful. Entrepreneurship-Knowledge and Skills Required for an Entrepreneurship. Business Environment-Central and State Government Industrial Policies and Regulations-Business Plan Preparations. Matching Entrepreneurship with the Project-Feasibility Report Preparation and Evaluation.(Case Study)					
References:					
1.R.Pannerselvam,”Production and operation Management”, Prentice Hall of India,2002.					
2.Reddin W.J.Effective Management,Tata McGraw Hill Company, New Delhi,1998.					
3.S.S.Khanka,Entrepreneurial Development,S.Chand and Company Limited, New Delhi,2001.					
4.Gaither,”Production and Operations Management”, Thomson Asia (P)Ltd., Bombay, Ninth Edition,2002.					
5.Chase,Aquilano & Jacob “Production and Operations Management”, Tata McGraw Hill, 8 th Edition,1999.					
6.Principles of Marketing :Philip Kotler,Tata McGraw Hill,8 th edition ,2004.					
7.Chakraborty,Managerial effectiveness and Quality of Work life: Indian Insights, Tata McGraw Hill,2000.					
8.Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi,2001.					
	TERM PAPER AND SEMINAR	0	0	6	2
❖	The Students are expected to prepare paper on any current emerging technology in computer science.				
❖	The Students are expected to deliver the seminars on the respective topics.				
❖	The students will be evaluated based on the presentation and demonstration.				
❖	Report and VIVA-VOCE				
MCS701	SOFTWARE ENGINEERING	3	1	0	4
Unit I					9
Introduction – Computer Based System Engineering – Emergent System Properties – Systems and their environment – System modeling – The system engineering process – System procurement - Software Process – Software Process Models – Process iteration – Software specification – Software design and implementation – Software validation – Software evolution – Automated process support – Project Management – Management activities - Project planning – Project scheduling – Risk Management.					
Unit II					9
Software Requirements – Functional and non-functional requirements – User requirements – System requirements – The software requirements document – Requirements engineering Processes – Feasibility studies – Requirements elicitation and analysis – Requirements validation – Requirements management – System Models – Context models – Behavioral models – Data models – Object Models – CASE Workbenches – Software Prototyping – Prototyping in the software process – Rapid prototyping technique – User Interface Prototyping – Formal specification – Formal specification in the software process – Interface specification – Behavioral specification					
Unit III					9
Architectural Design – System structuring – Control models – Modular decomposition – domain Specific architectures – Distributed systems architectures – Multiprocessor architectures – Client-Server Architectures – Distributed object architectures – CORBA – Object-Oriented Design – Objects and object classes – Design Evolution – Real-time Software design – System design, Real-time executives –Monitoring and control systems – Data acquisition systems – Design with reuse – Component-based development – Application families – Design patterns – User Interface Design – Principles – User Interaction – Information Presentation – User Support – Interface Evaluation					
Unit-IV:					9
Dependability – Critical systems – Availability and Reliability – Safety – Security – Critical System Specification – Software Reliability Specification – Safety Specification – Security Specification – Critical System Development – Fault Minimization – Fault Tolerance – Fault Tolerant Architectures – Safe System Design					
Unit V					9
Verification and Validation – Planning – Software inspections – Automated static analysis – Clean room Software Development – Software Testing – Defect Testing – Integration Testing – Object Oriented Testing – Testing Work benches – Critical Systems validation – Formal methods and Critical Systems - Reliability validations – Safety Assurance – Security Assessments – Managing people-Software cost estimation- Quality management – process improvement.					
References					
1.	Sommerville I., “ Software Engineering”, 6 th edition, Addison Wesley, 2001.				
2.	Fairley, “Software Engineering Concepts”, McGraw-Hill, 1985.				
3.	Roger S. Pressman, ‘Software Engineering: A Practitioner Approach’, 5 th edition, McGraw-Hill, 1999.				
4.	David Gustafson, “ Software Engineering”, Schaum’s outlines, Tata McGraw-Hill, 2003.				

MCS703	COMPUTER NETWORKS	3	0	3	4
DATA TRANSMISSION		9			
Introduction - motivation and tools - transmission media - local asynchronous communication - long distance communication.					
PACKET TRANSMISSION		9			
Packets-frames-error detection-LAN technologies and network topology-interface hardware-Extending LANs: fiber modems, repeaters, bridges and switches—Long distance digital connection technologies- WAN technologies and routing.					
INTERNETWORKING		9			
Network ownership ,service paradigm and performance-protocols and layering-internetworking concepts, architecture and protocols-IP internet protocol addresses-binding protocol addresses(ARP) –IP datagrams and datagram forwarding-IP encapsulation, fragmentation and reassembly: UDP- TCP: reliable transport service					
NETWORK APPLICATIONS		9			
Client server interaction-the socket interface-file transfer-remote file access-domain name system-electronic mail-CGI technology for dynamic web documents-java technology for active web documents-network security-RPC and middleware.					
NETWORK MANAGEMENT		9			
Introduction to SNMP RMON1 and RMON2					
References					
1. Douglas E Comer, Ralph E Droms Computer Networks and Internets,2/e Pearson Education 2003.					
2. William Stallings, SNMP, SNMPv2, SNMPv3& RMON 1&2, 3 rd Edition, Pearson Education 2003.					
3. Andrew S Tanenbaum Computer Networks 4 th Edition, Pearson Education 2003.					
4. Forouzan ,Data Communications And Networking 2 nd Edition TMH.					
5. Peterson Davie, “Computer Networks” , Addison Wesley, 2001.					
6. Willam A.Shay, Under standing data communications and Networks 2 nd Edition ,Thomson books,2003 .					

ELECTIVE I
I SEMESTER

MCSE01	OBJECT ORIENTED SYSTEM ANALYSIS AND DESIGN	3	0	0	3
OBJECT ORIENTED DESIGN PRINCIPLES		9			
The Object model – Classes and objects – Complexity – Classification – Notation – Process – Pragmatics – Binary and entity relationship – Object types – Object state – OOAD life cycle					
OBJECT ORIENTED ANALYSIS		9			
Overview of Object Oriented Analysis – Shaler/Mellor, Coad/Yourdan, Rambaug, Booch – UML – Usecases – Conceptual model – Behavior analysis – Overview of diagrams – Aggregation.					
OBJECT ORIENTED DESIGN METHODS		9			
UML – Diagrams – Collaborations – Sequence – Class – Design patterns and frameworks – Comparisons with other design methods.					
MANAGING OBJECT ORIENTED DEVELOPMENT		9			
Managing analysis and design – Evaluation – Testing – Coding – Maintenance - Metrics					
CASE STUDIES IN OBJECT ORIENTED DEVELOPMENT		9			
Design of foundation class libraries – Object Oriented Databases – Client/Server computing – Middleware					
References:					
1. Craig Larman, “Applying UML and Patterns”, Addison Wisley, 2000					
2. Grady Booch, James Rambaug, Ivar Jacobson , “The Unified Modeling Language User guide”, Addison Wisley 1999					
3. Ali Bahrami, “Object Oriented System Development”, McGraw Hill International Edition 1999					
4. Fowler, “Analysis Patterns”, Addison Wisley, 1994					
5. Erich Gamna, “Design Patterns”, Addison Wisley, 1994					

MCSE03	DIGITAL IMAGE PROCESSING	3	0	0	3
DIGITAL IMAGE FUNDAMENTALS		9			
Image Transforms - Walsh, Hadamard, Discrete cosine, Hotelling Transforms, Image formation, File formats – FFT.					
IMAGE ENHANCEMENT AND RESTORATION		9			
Histogram modification techniques - Image smoothening - Image Sharpening - Image Restoration - degradation Model - Digitalization of Circulant and block circulant matrices - Algebraic approach to restoration.					
IMAGE COMPRESSION AND SEGMENTATION		9			
Compression Models - Elements of information theory - Error free Compression -Image segmentation - Detection of Discontinuities - Edge linking and boundary detection - Threshold - Regions Oriented Segmentations - Morphology.					
FEATURE EXTRACTION		9			
Image feature description - Interpretation of Line drawings, Image pattern recognition algorithms.					
KNOWLEDGE REPRESENTATION AND USE		9			
Knowledge representations and use - Image analysis using Knowledge about scenes - Image understanding using two dimensional methods.					

MCSE05	AGENT BASED SYSTEMS	3	0	0	3
INTRODUCTION					9
Definitions - History - Intelligent Agents - Structure-Environment - Basic Problem Solving Agents-Formulating - Search Strategies - Intelligent search - Game playing as search.					
KNOWLEDGE BASED AGENTS					9
Representation - Logic-First order logic - Reflex Agent - Building a knowledge Base - General Ontology -Inference - Logical Recovery					
PLANNING AGENTS					9
Situational Calculus - Representation of Planning - Partial order Planning- Practical Planners – Conditional Planning - Replanning Agents					
AGENTS AND UNCERTAINTY					9
Acting under uncertainty - Probability Bayes Rule and use - Belief Networks - Utility Theory – Decision-Network - Value of Information - Decision Theoretic Agent Design.					
HIGHER LEVEL AGENTS					9
Learning agents - General Model - Inductive Learning - Learning Decision Trees-Reinforcement Learning -Knowledge in Learning - Communicative agents -Types of communicating agents - Future of AI					
References					
1. Stuart Russell and Peter Norvig, Artificial Intelligence - A Modern Approach, Pearson Education, 2003.					
2. Patrick Henry Winston, Artificial Intelligence, 3rd Edition, AW, 1999.					
3. Nils.J.Nilsson, Principles of Artificial Intelligence, Narosa Publishing House, 1992.					

MCSE07	NEURAL NETWORKS	3	0	0	3
BACK PROPAGATION					9
Introduction to Artificial Neural Systems - Perceptron - Representation - Linear separability - Learning -Training algorithm - The back propagation network - The generalized delta rule - Practical considerations -BPN applications.					
STATISTICAL METHODS					9
Hopfield nets - Cauchy training - Simulated annealing - The Boltzmann machine. Associative memory -Bidirectional associative memory - Applications.					
COUNTER PROPAGATION NETWORK & SELF ORGANIZING MAPS					9
CPN building blocks - CPN data processing. SOM data processing - Applications.					
ADAPTIVE RESONANCE THEORY AND SPATIO TEMPORAL PATTERN CLASSIFICATION					9
ART network description - ART1 - ART2 - Application. The formal avalanche - Architecture of spatio temporal networks - The sequential competitive avalanche field - Applications of STNs.					
NEO – CONGNITRON					9
Cognitron - Structure & training - The neocognitron architecture - Data processing - Performance – Addition of lateral inhibition and feedback to the neocognitron. Optical neural networks - Holographic correlators.					
References					
1. James Freeman A. and David Skapura M., Neural Networks - Algorithms, Applications & Programming Techniques Pearson Education, 2000.					
2. Yegnanarayana B., Artificial Neural Networks, Prentice Hall of India Private Ltd., New Delhi, 1999.					
3. Laurene Fausett, Fundamentals of Neural Networks, Pearson Education 2003.					

MCSE02	MULTIMEDIA SYSTEMS	3	0	0	3
INTRODUCTION					9
Multimedia applications - System architecture - Objects of Multimedia Systems -Multimedia databases.					
COMPRESSION AND FILE FORMATS					9
Types of compression - Image compression - CCITT - JPEG - Video image compression - MPEG-DVI Technology - Audio compression - RTF format - TIFF file format - RIFF file format - MIDI - JPEG DIB - TWAIN.					
INPUT/OUTPUT TECHNOLOGIES					9
Traditional devices - Pen input - Video display systems - Scanners - Digital audio - Video images and animation.					
STORAGE AND RETRIEVAL					9
Magnetic Media - RAID - Optical media - CD-ROM - WORM - Juke box - Cache management – DVD.					
APPLICATION DESIGN					9
Application classes - Types of systems - Virtual reality design - Components - Databases - Authoring Systems - Hyper media - User interface design - Display/Playback issues - Hypermedia linking and embedding.					
References					
1. Andleigh PK and Thakrar K, Multimedia Systems Design, Pearson Education, 2003					
2. Vaughan T, Multimedia, Tata McGraw Hill, 1999.					
3. Koegel Buford JFK, Multimedia Systems, Addison Wesley Longman, 1999.					
4. Steinmetz, Multimedia: Computing, Communicatio and Application Pearson Education 1996					
5. Rao, Bojkovic & Milovanovic, Multimedia Communication Systems: Techniques standards & Networks PHI 2003					

MCSE04	SOFT COMPUTING	3	0	0	3
ARTIFICIAL NEURAL NETWORKS					9
Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning -Back propagation networks - Kohnen's self organizing networks - Hopfield network..					

FUZZY SYSTEMS	9
Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.	
NEURO - FUZZY MODELING	9
Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation.	
GENETIC ALGORITHMS	9
Survival of the Fittest - Fitness Computations - Cross over - Mutation -Reproduction - Rank method - Rank space method	
SOFTCOMPUTING AND CONVENTIONAL AI	9
AI search algorithm - Predicate calculus - Rules of inference – Semantic networks - Frames - Objects - Hybrid models - Applications.	

References

1. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Pearson Education 2003.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 1997.
3. Laurene Fausett, "Fundamentals of Neural Networks", Pearson Education, 2003.
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5. Nih J.Nelsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Ltd., 1998.
6. D.E . Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley,N.Y, 1989.

MCSE06	PATTERN RECOGNITION	3	0	0	3
PATTERN RECOGNITION	9				
Overview of pattern recognition - Discriminant functions - Supervised learning - Parametric estimation -Maximum likelihood estimation - Bayesian parameter estimation - Perceptron algorithm - LMSE algorithm -Problems with Bayes approach - Pattern classification by distance functions - Minimum distance pattern classifier.					
UNSUPERVISED CLASSIFICATION	9				
Clustering for unsupervised learning and classification - Clustering concept - C-means algorithm - Hierarchical clustering procedures - Graph theoretic approach to pattern clustering - Validity of clustering solutions.					
STRUCTURAL PATTERN RECOGNITION	9				
Elements of formal grammars - String generation as pattern description - Recognition of syntactic description - Parsing - Stochastic grammars and applications - Graph based structural representation.					
FEATURE EXTRACTION AND SELECTION	9				
Entropy minimization - Karhunen - Loeve transformation - Feature selection through functions approximation - Binary feature selection.					
RECENT ADVANCES	9				
Neural network structures for Pattern Recognition - Neural network based Pattern associates – Unsupervised learning in neural Pattern Recognition - Self organizing networks - Fuzzy logic - Fuzzy pattern classifiers - Pattern classification using Genetic Algorithms.					

References

1. Robert J.Schalkoff, Pattern Recognition : Statistical, Structural and Neural Approaches, John Wiley & Sons Inc., New York, 1992.
2. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company, London, 1974.
3. Duda R.O., and Hart.P.E., Pattern Classification and Scene Analysis, Wiley, New York,1973.
4. Morton Nadier and Eric Smith P., Pattern Recognition Engineering, John Wiley & Sons, New York, 1993

MCSE08	INTERNET PROGRAMMING	3	1	0	4
INTRODUCTION TO INTERNET SERVICES:CLIENT SIDE SCRIPTING	6				
Overview – Hyper Text Markup Language – Java Script Programming – DHTML:					
FUNDAMENTALS OF JAVA	9				
Features of Java – Object Oriented Concepts – Classes – Objects – Abstract Class – Interfaces - Packages – Exception Handling – Multi Threading.					
CORE JAVA	10				
Abstract Window Toolkit – JFC - Applets – Networking .					
ADVANCED JAVA	10				
Networking - JDBC – Servlets – JSP (Java Server Pages) – JAVA BEANS .					
ENTERPRISE TECHNOLOGIES	10				
RMI – Intoduction to EJB .					

References

1. Deitel & Deitel, Internet & World Wide Web How to program, Prentice Hall 2000.
2. Java 2: The Complete Reference, D. Norton and H. Schildt, Tata McGraw- Hill 2000.
3. Java Servlets: Application Development, Karl Moss, 2/e, Tata McGraw- Hill.
4. Bruce Eckel, Thinking in Java 2nd Edition, Pearson Education 2000.
5. Cay S. Horstmann, Gray Cornell, Core Java 2 Vol. 1 & 2. Pearson Education 2001

MCSE10	PARALLEL COMPUTERS AND ALGORITHMS	3	0	0	3
INTRODUCTION	6				
Fundamentals – Data parallelism – Shared variable – Generation communication – Message passing					

MULTIPROCESSOR ARCHITECTURE	10
Computational demand of modern science – Advent of Parallel processing - Parallel processing Terminology – PRAM Algorithms – PRAM Model of Parallel Computation – Reducing the number of processors – Problem Defying Fast Solution on PRAMS – Processor Arrays – Multiprocessors – Multi computers – Fylnns’ Taxonomy	
PARALLEL PROCESSOR	10
Parallel programming languages – Programming parallel processes – C* - SEQUENIC – nCUBE C, OCCAM, C_LINDA	
ALGORITHM	10
Elementary parallel Algorithms – Matrix Multiplication – Fast Fourier Transform – Sorting – Dictionary Operation – Graph Algorithm – Combinational Search	
CASE STUDIES	9
Overview & Main Features of EVAL – Syntax Description – Operations & Expressions – Modules – Substitutes	
References	
1. Vipin Kumar , An Introduction to Parallel Computing: Design and Analysis of Algorithms 2 nd Edition Pearson Education 2002. 2. Kai Hwang, Advanced Computer Architecture, TMH 2003. 3. Wilkinson, Parallel Programming, Pearson Education 1999. 4. Parallel Computing Theory and Practice, Michael J Quinn, McGraw Hill	

MCSE12	E-COMMERCE	3	0	0	3
INTRODUCTION		9			
Infrastructure for Electronic Commerce - Networks - Packet Switched Networks - TCP/IP Internet protocol - Domain name Services - Web Service Protocols - Internet applications - Utility programs – Markup Languages - Web Clients and Servers - Intranets and Extranets - Virtual private Network.					
CORE TECHNOLOGY		9			
Electronic Commerce Models - Shopping Cart Technology - Data Mining - Intelligent Agents – Internet Marketing - XML and E-Commerce.					
ELECTRONIC PAYMENT SYSTEMS		9			
Real world Payment Systems - Electronic Funds Transfer - Digital Payment -Internet Payment Systems - Micro Payments - Credit Card Transactions - Case Studies.					
SECURITY		9			
Threats to Network Security - Public Key Cryptography - Secured Sockets Layer - Secure Electronic Transaction - Network Security Solutions - Firewalls.					
INTER/INTRA ORGANIZATIONS ELECTRONIC COMMERCE		9			
EDI - EDI application in business - legal, Security and Privacy issues - EDI and Electronic commerce - Standards - Internal Information Systems - Macro forces - Internal commerce - Workflow Automation and Coordination - Customization and Internal commerce - Supply chain Management.					
References:					
1. Ravi Kalakota and Andrew B Whinston , Frontiers of Electronic commerce, AddisonWesley, 1996					
2. Pete Loshin, Paul A Murphy , Electronic Commerce, II Edition , Jaico Publishers 1996.					
3. David Whiteley, e - Commerce : Strategy, Technologies and Applications - McGraw Hill , 2000.					

MCSE14	DATA-MINING AND DATA-WAREHOUSING	3	0	0	3
INTRODUCTION		9			
Relation to statistics, databases, machine learning - Taxonomy of data mining tasks - Steps in data mining process - Overview of data mining techniques					
VISUALIZATION AND STATISTICAL PERSPECTIVES		9			
Visualization - Dimension reduction techniques - Data summarization methods - Statistical Perspective - Probabilistic - Deterministic models - Clustering - Regression analysis - Time series analysis – Bayesian learning.					
PREDICTIVE MODELING		9			
Predictive Modeling - Classification - Decision trees - Patterns - Association rules - Algorithms.					
DATA WAREHOUSING		9			
Design - Dimensional Modeling - Meta data - Performance issues and indexing -VLDB issues – Development life cycle - Merits.					
APPLICATIONS		9			
Tools - Applications - Case Studies.					
References:					
1. Usama M.Fayyad, Geogory Piatetsky - Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, "Advances in Knowledge Discovery and Data Mining", The M.I.T Press, 1996.					
2. Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, Morgan Kauffmann Publishers,2000.					
3. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.					
4. Sean Kelly, "Data Warehousing in Action", John Wiley & Sons Inc., 1997.					

MCSE16	EMBEDDED SYSTEMS	3	0	0	3
OVERVIEW					9
Overview of embedded systems, Design challenge, Processor technology, IC technology, Design technology- Custom-Single purpose processors: Custom single purpose processor design, optimizing custom single processors, Basic architecture, operation, programmers view, development environment, Application specific instruction set processors, selecting a microprocessor					
STANDARD SINGLE-PURPOSE PROCESSORS					9
peripherals Timers, counters, watchdog timers, UART ,Pulse width modulator, LCD controller, Keypad controller, ADC, Real time clocks					

MEMORY	9
Memory write ability and storage performance, Common memory types, composing memories, memory hierarchy and cache, advanced RAM: DRAM, FPM DRAM, EDO DRAM, SDRAM, RDRAM, Memory management Unit	
INTERFACING	9
Arbitration, Muti-level bus architectures, Serial protocols: I2C bus, CAN bus, Fire Wire bus, USAB, Parallel protocols: PCI and ARM bus, Wireless Protocols: IrdA, Bluetooth,IEEE802.11	
CASE STUDIES	9
Digital Camera: Case study of embedded system - Brief study State Machine and Concurrent Process Models - Control systems: Open loop and closed loop systems, General control systems and PID controllers, Fuzzy control, Practical issues related to computer based control, Benefits of computer based control implementations	
Reference	
1. Frank Vahid and Tony Givargis, Embedded System Design: A Unified Hardware and Software Introduction, Wiley 2001 2. Mazidi, The 8051 Microcontrollers & Embedded Systems, Pearson Education 2003. 3. Janathan W. Valvano, Embedded Microcomputer Systems: Real-time Interfacing, Thomson Learning 2003.	

MCSE09	MOBILE COMMUNICATION	3	1	0	4
INTRODUCTION					9
Medium access control – Telecomm unication systems - Satellite systems - Broadcast systems.					
STANDARDS					9
Wireless LAN - IEEE 802.11 - HIPERLAN - Bluetooth.					
ADHOC NETWORKS					9
Characteristics - Performance issues - Routing in mobile hosts.					
NETWORK ISSUES					9
Mobile IP - DHCP - Mobile transport layer - Indirect TCP - Snooping TCP - Mobile TCP - Transmission / time-out freezing - Selective retransmission - Transaction oriented TCP.					
APPLICATION ISSUES					9
Wireless application protocol - Dynamic DNS - File systems - Synchronization protocol - Context-aware applications - Security - Analysis of existing wireless network .					
References					
1. J. Schiller, Mobile Communications, Addison Wesley,2000. 2. William C.Y.Lee, Mobile Communication Design Fundamentals, John Wiley,1993.					

MCSE11	ADVANCED WEB TECHNOLOGY	3	1	0	4
FUNDAMENTALS					9
Introduction to the web - Web- enabling Technologies - Web service Protocol - Web Design concepts - Examining good and bad web design - Page Design Resources.					
SIMPLE DESIGN ISSUES					9
Page Design - HTML - Web page style considerations - Page composition - Type faces - Tag parameters - Color and graphics for web pages - WYSIWYG web page editor - Dreamweaver.					
ADVANCE DESIGN ISSUED					9
Advanced Page design - tables and frames - preparing graphics and animations forms - cascading style sheets -user interface design - page grid - page templates - usability testing.					
SCRIPTING IN DESIGN					9
Typography and Graphic design for the web - Creating transparent GIF - Lean graphics - Image maps – Palette map - Web programming - Web site Garage - W3C HTML validation services - Net mechanic - DHTML - XML.					
TOOLS AND APPLICATIONS					9
Online Applications - Developing an on-line shopping application - Data Base design issues - connecting Data Base with tools such as Java, ASP.					
References					
1. Deitel and Deitel, Internet and World Wide Web how to program, Prentice Hall, 2000. 2. Bob Breed Love, Web Programming Unleashed, Sams net Publications, 1996. DHTML `O' Reiley Publications, 2000. 3. Goldfarb, The XML handbook 2 nd Edition, Pearson Education 2000. 4. Hall, Core Web Programming 1 st Edition, Pearson Education 1998. 5. Walther, Active Server Pages 2.0 Unleashed, Techmedia.					

MCSE13	NETWORK SECURITY	3	1	0	4
INTRODUCTION					9
Attacks - Services - Mechanisms - Conventional Encryption - Classical and Modern Techniques – Encryption Algorithms - Confidentiality.					
PUBLIC KEY ENCRYPTION					9
RSA - Elliptic Curve Cryptography - Number Theory Concepts					

MESSAGE AUTHENTICATION	9
Hash Functions - Digest Functions - Digital Signatures - Authentication protocols.	
NETWORK SECURITY PRACTICE	9
Authentication, Applications - Electronic Mail Security - IP Security - Web Security.	
SYSTEM SECURITY	9
Intruders - FireWalls - Current Standards.	
References	
1. Stallings, Cyptography & Network Security - Principles & Practice, Pearson Education, 1999.	
2. Bruce, Schneier, Applied Cryptography, 2nd Edition, Toha Wiley & Sons, 1996.	
3. Wadlow, The Process of Network Security, Pearson Education 2000.	
4. Charles P. Pfleeger, Security in Computing, Pearson Education 1997.	

MCSE15	HIGH SPEED NETWORKS	3	1	0	4
INTRODUCTION					9
Networking history – Need for speed and quality of services – Advanced TCP and ATM networks – Need for the protocol architecture – TCP/IP protocol architecture – OSI model – Internetworking – Transmission control protocol – User datagram protocol – Internet protocol – IPv6.					
ADVANCED NETWORKS					9
Packet switching networks – Frame relay networks – ATM protocol architecture – ATM logical connections – ATM cell – ATM service categories – ATM adoption layer – The emergency of high speed LANs-Ethernet – Fiber channel – Wireless LANs.					
CONGESTION AND TRAFFIC MANAGEMENT					9
Effect of congestion – Congestion and control – Traffic management – Congestion control in packet switching networks – Frame relay congestion control – Need for Flow and error control - Link control mechanisms – ARQ performance – TCP flow control – TCP congestion control – Performance of TCP over ATM – Requirement for ATM traffic and congestion control – ATM traffic Related attributes – Traffic management framework – Traffic control – ABR traffic management – GFR traffic management.					
INTERNET ROUTING					9
Elementary concepts of graph theory – Shortest path length determination – Internet routing principle - Distance – Vector protocol: RIP – Link state protocol: OSPF – Path vector protocol: BGP and IDRP – Multicasting.					
QUALITY OF SERVICE					9
Integrated services architecture (ISA) – Queuing discipline – Random early detection – Differentiated services – Resource reservation: RSVP – Multiprotocol label switching – Real time transport protocol (RTP)					
References					
1. William Stallings, “High speed Networks and Internets”, Second edition, Pearson Education, 2002.					
2. Halsall, “Data Communications Computer Networks and Open Systems”, Pearson Education					
3. Wolf Gary Effelsberg, Otto Spaniol, Andre D., "High Speed Networking for Multimedia applications", Kluwer Academic publishers, 1996.					
4. Andrew S.Tanenbaum, "Computer Networks", 3/E, Prentice Hall, 1996					

MCSE17	LEGACY SYSTEMS	3	1	0	4
MVS/Z/OS, TSO, JCL					9
MVS overview-Z/OS enhanced features over MVS-architectural summary-subsystems-TSO ISPF-JCL-Job entry subsystems- introduction of parameters and coding rules-JOB Statements-EXEC Statement, condition, disposition, DD Statements-DCB Parameters-Instream data-JCL procedures					
VSAM					9
Symbolic Names-SDSF-Utilities-System Abend Codes-Access Method Services-VSAM Concepts-VSAM Internal organization-VSAM Catalog Management-Generation Data Groups(GDG).					
VS COBOL FOR OS/390 & Z /OS					9
Introduction-Program Organization-COBOL DIVISIONS-Language Syntax-I/O and File handling-Environmental interconnectivity-with CICS,DB2,IMS etc-Compiling debugging and error codes					
DB2 APPLICATION PROGRAMMING					9
Relational DBMS-An introduction-Overview of DB/UDB7.1-DB2 Objects-Executing SQL form SPUFI/QMF-Coding SQL in host application languages-Coding dynamic SQL in host languages-Performance monitoring-DB2 utilities-DB2 with CICS-DB2 Connectivity with other DBMS.					
CICS					9
CICS Concepts-An introduction-Batch vs Online processing-CICS components for interconnectivity-Application programming-MAPS and displays-File handling-CICS Queuing Facilities-CICS-Debugging Techniques-Program Control					

Note: Course Materials to be Provided by Industry Partners.

MCSE19	DISTRIBUTED COMPUTING	3	0	0	3
SOFTWARE ARCHITECTURES					9
Client - Server Architectures - Challenges - Design Methodology - Intranets and Groupware - Hardware and Software for Intranet - Groupware and Features - Network as a Computer - The Internet - IP Addressing - Internet Security - Open Systems - Concepts and Reality.					
OPERATING SYSTEM ISSUES					9
Distributed Operating Systems - Transparency - Inter-Process Communication - Client - Server Model - Remote Procedure Call - Group Communications - Threads					

SYSTEM MODELS	9
System Models - Process Synchronization - Deadlocks - Solutions - Load Balancing - Distributed File Systems - Distributed Shared Memory Systems - Micro-Kernels.	
FUNDAMENTAL DISTRIBUTED COMPUTING ASPECTS	9
Theoretical Foundations - Logical Clocks - Vector Clocks - Global State - Termination - Correctness - Election Algorithms - Termination Detection - Fault Tolerance - Missing Token - Consensus Algorithms - Byzantine - Consensus - Interactive Consistency.	
MANAGING DISTRIBUTED DATA	9
Distributed Databases - Distribution Transparency - Distributed Database Design - Query Translation – Query Optimization - Concurrency Control - Object-Oriented Databases - Strategic Considerations - Applications of Object-oriented Databases.	
References:	
1. Tanenbaum, Distributed Systems: Principles and Paradigms, Pearson Education 2003 2. Albert Fleishman, Distributed Systems - Software Design & Implementation, Springer-Verlag, 1994. 3. Mukesh Singal and Shivaratu N.G., Advanced Concepts in Operating Systems, McGraw Hill, Newyork 1994. 4. George Coulouris and Jean Dollimore, Distributed Systems - Concepts and Design 3 rd Edition, Pearson Education 2003. 5. Tanenbaum, Distributed Operating Systems, Pearson Education 2003	

MCSE21	WEB SERVICES	3	1	0	4
WEB SERVICES CONCEPTS- XML SCHEMA BASIC		9			
Introduction to Web services, Benefits of Web services, How Web services work Understanding XML Schema – Basic. Elements and attributes, Complex types and simple types Occurrence constraints, Element groups, nil values.					
UNDERSTANDING TO XML SCHEMA – ADVANCED		9			
Namespaces, Qualification, Global declarations, Modular schemas, Extensions and restrictions, Substitution groups, importing types.					
UNDERSTANDING WEB SERVICES STANDARDS		9			
Understanding Soap (Simple Object Access Protocol) SOAP and XML, SOAP messages, SOAP message exchange model, SOAP encoding and XML schemas, SOAP data types, SOAP transports.					
UNDERSTANDING WSDL (WEB SERVICES DESCRIPTION LANGUAGE)		9			
Describing Web services, WSDL anatomy, Defining data types and messages, defining a Web service interface, defining a Web service implementation, Message patterns.					
UNDERSTANDING UDDI (Universal Directory And Discovery Interface)		9			
UDDI registries, UDDI publish Interface, UDDI inquiry Interface, Using UDDI and WSDL together.					
References:					
1. Keith Ballinger, .NET web services Architecture & Implementation, Pearson Education 2003.					
2. Deital & Deital, C# How to Program, Pearson Education 2002.					
3. Pardi, XML in Action: Web Technology, PHI 2002					

MCSE23	CLIENT SERVER COMPUTING	3	0	0	3
INTRODUCTION TO CLIENT/SERVER		9			
Necessity for Client/Server computing – Components of Client/Server – Benefits of Client/Server - Client/Server models – Planning for Client/Server – Technical planning.					
MIGRATING TO CLIENT/SERVER		9			
Impact of Client/Server – Hardware – Technology – Software – Database management system – Data warehousing.					
NETWORKING		9			
The basics – System and Network management – middleware – communication – essential techniques.					
CASE TOOLS		9			
Using CASE Tools – Benefits of CASE – Other functions – Workflow – Database Design – Object Oriented Development.					
APPLICATION DEVELOPMENT		9			
Events – Domain – Application Models – GUI Development – Upgrading to Client/Server – Performance tuning and Optimization.					
References:					
1. Jenkins et al., “Client/Server Unleashed” Techmedia, SAMS Publishing 2001					
2. Roger Fournier, A Methodology for Client/Server and Web Application Development, Prentice Hall 1999.					
3. David Ruble, Practical Analysis & Design for Client/Server & GUI Systems, Prentice Hall 1997.					