Faculty of Engineering & Technology

M.Tech(Computer Science)

Scheme of Examination & Detailed Syllabi
(2016-17)

List of Courses (Computer Science)

CORE COURSE:

Subject/Paper

- Advanced Computer Architecture (MTCSCS101)
- Advanced Commnication Networks (MTCSCS102)
- Data Mining & Data Warehousing (MTCSCS103)
- Distributed Algorithms (MTCSCS201)
- Cloud Computing (MTCSCS202)
- Real Time Systems (MTCSCS203)
- E-Business Systems (MTCSCS301)
- Soft computing (MTCSCS302)
- Information System Security (MTCSCS303)
- Seminar (MTCSCS307)
- Dissertation(MTCSCS401)

ELECTIVE COURSE

- Distributed Computing (MTCSCS104A)
- Advanced Topics In Algorithms (MTCSCS104B)
- Advanced Compilation Techniques (MTCSCS104C)
- Artificial Intelligence (MTCSCS204A)
- Advanced Database Systems (MTCSCS204B)
- Multimedia Computing (MTCSCS204C)
- Grid Computing (MTCSCS304A)
- Parallel Computing (MTCSCS304B)
- Object Oriented Analysis and Design (MTCSCS304C)

M.Tech Program in Computer Science & Engineering with Specialization in Computer Science

SEMESTER I

Theory Papers

Code	Title Of Subject	L	P	T	IA	EA	Total	Credits
MTCSCS101	Advanced Computer Architecture	3	0	1	50	100	150	4
MTCSCS102	Advanced Commnication Networks	3	0	1	50	100	150	4
MTCSCS103	Data Mining & Data Warehousing	3	0	1	50	100	150	4
Electives (Any One)								
MTCSCS104A	Distributed Computing	3	0	1	50	100	150	4
MTCSCS104B	Advanced Topics In Algorithms	3	0	1	50	100	150	4
MTCSCS104C	Advanced Compilation Techniques	3	0	1	50	100	150	4
Practical/Viva Voce								
		L	**P**	**T**	**Sessional**	**Practical**	**Total**	**Credits**
MTCSCS 105	Advanced Commnication Networks Lab	0	2	0	60	40	100	1
Total		**12**	**02**	**4**	**260**	**440**	**700**	**17**

SEMESTER II

Theory Papers

Code	Title Of Subject	L	P	T	IA	EA	Total	Credits
MTCSCS201	Distributed Algorithms	3	0	1	50	100	150	4
MTCSCS202	Cloud Computing	3	0	1	50	100	150	4
MTCSCS203	Real Time Systems	3	0	1	50	100	150	4
Electives (Any One)								
MTCSCS204A	Artificial Intelligence	3	0	1	50	100	150	4
MTCSCS204B	Advanced Database Systems	3	0	1	50	100	150	4
MTCSCS204C	Multimedia Computing	3	0	1	50	100	150	4
Practical/Viva Voce								
		L	**P**	**T**	**Sessional**	**Practical**	**Total**	**Credits**
MTCSCS 205	Cloud Computing Lab	0	2	0	60	40	100	1
Total		**12**	**02**	**4**	**260**	**440**	**700**	**17**

SEMESTER III

Theory Papers

Code	Title Of Subject	L	P	T	IA	EA	Total	Credits
MTCSCS301	E-Business Systems	3	0	1	50	100	150	4
MTCSCS302	Soft computing	3	0	1	50	100	150	4
MTCSCS303	Information System Security	3	0	1	50	100	150	4
Electives (Any One)								
MTCSCS304A	Grid Computing	3	0	1	50	100	150	4
MTCSCS304B	Parallel Computing	3	0	1	50	100	150	4
MTCSCS304C	Object Oriented Analysis and Design	3	0	1	50	100	150	4
Practical/Viva Voce								
		L	P	T	Sessional	Practical	Total	Credits
MTCSCS305	Seminar	0	-	-	60	40	100	2
Total		**12**	**00**	**4**	**260**	**440**	**700**	**18**

SEMESTER IV

Code	Title Of Subject	L	T	P	IA	EA	Total	Credits
MTCSCS401	Dissertation	0	0	0	300	400	700	12
Total		**-**	**-**	**-**	**300**	**400**	**700**	**12**

Note-: The student will submit a synopsis in the III semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to the dissertation should be delivered one after starting of IV semester. The progress will be monitored through seminars and progress reports.

- The Total Number of credits of the M-Tech(Production Engineering) program=64
- The award of the degree a student shall be required to earn the minimum of 60 credits.

M.Tech Program in Computer Science & Engineering with Specialization in Computer Science

SEMESTER I

Theory Papers

Code	Title Of Subject	L	P	T	IA	EA	Total	Credits
MTCSCS101	Advanced Computer Architecture	3	0	1	50	100	150	4
MTCSCS102	Advanced Commnication Networks	3	0	1	50	100	150	4
MTCSCS103	Data Mining & Data Warehousing	3	0	1	50	100	150	4
Electives (Any One)								
MTCSCS104A	Distributed Computing	3	0	1	50	100	150	4
MTCSCS104B	Advanced Topics In Algorithms	3	0	1	50	100	150	4
MTCSCS104C	Advanced Compilation Techniques	3	0	1	50	100	150	4
Practical/Viva Voce								
		L	**P**	**T**	**Sessional**	**Practical**	**Total**	**Credits**
MTCSCS 105	Advanced Commnication Networks Lab	0	2	0	60	40	100	1
Total		**12**	**02**	**4**	**260**	**440**	**700**	**17**

Advanced Computer Architecture (MTCSCS 101)

UNIT 1:Parallel Computer Models: The state of computing, Classification of parallel computers, Multiprocessors and multicomputers, Multivector and SIMD computers. Program and network properties: Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms

UNIT 2:System Interconnect Architectures: Network properties and routing, Static interconnection Networks, Dynamic interconnection Networks, Multiprocessor system Interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

Advanced processors:Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors

UNIT 3:Pipelining: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines

UNIT 4: Memory Hierarchy Design: Cache basics & cache performance, reducing miss rate and miss penalty, multilevel cache hierarchies, main memory organizations, design of memory hierarchies. Scalable point – point interfaces: Alpha364 and HT protocols, high performance signaling layer.

Enterprise Memory subsystem Architecture: Enterprise RAS Feature set: Machine check, hot add/remove, domain partitioning, memory mirroring/migration, patrol scrubbing, fault tolerant system.

UNIT 5:Multiprocessor architectures: Symmetric shared memory architectures, distributed shared memory architectures, models of memory consistency, cache coherence protocols (MSI, MESI, MOESI), scalable cache coherence, overview of directory based approaches, design challenges of directory protocols, memory based directory protocols, cache based directory protocols, protocol design tradeoffs, synchronization.

TEXT BOOKS:

1. Kai Hwang, "Advanced computer architecture"; TMH. 2000

2. D. A. Patterson and J. L. Hennessey, "Computer organization and design", Morgan Kaufmann, 2nd Ed. 2002

REFERENCES:

1. J.P.Hayes, "computer Architecture and organization"; MGH. 1998

2. Harvey G.Cragon,"Memory System and Pipelined processors"; Narosa Publication. 1998

3. V.Rajaranam & C.S.R.Murthy, "Parallel computer"; PHI. 2002

Advanced Communication Networks(MTCSCS 102)

UNIT 1:Introduction: Introduction to Network models-ISO-OSI, SNA, Appletalk and TCP/IP models. Review of Physical layer and Data link layers, Review of LAN (IEEE 802.3, 802.5, 802.11b/a/g, FDDI) and WAN (Frame Relay, ATM, ISDN) standards.

UNIT 2:Network layer:ARP, RARP, Internet architecture and addressing, internetworking, IPv4, overview of IPv6, ICMP, Routing Protocols- RIP, OSPF, BGP, IP over ATM.

UNIT 3:Transport layer: Design issues, Connection management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Finite state machine model.

UNIT 4 :Application layer:WWW, DNS, e-mail, SNMP, RMON

UNIT 5:Network Security: Cryptography, Firewalls, Secure Socket Layer (SSL) and Virtual Private Networks (VPN).

Case study

Study of various network simulators, Network performance analysis using NS2

TEXT BOOKS:

1. Behrouz A. Forouzan, "TCP/IP Protocol Suit", TMH, 2000.

2. Tananbaum A. S., "Computer Networks", 3rd Ed., PHI, 1999.

REFERENCES:

1. Black U, "Computer Networks-Protocols, Standards and Interfaces", PHI, 1996.

2. Stallings W., "Data and Computer Communications", 6th Ed., PHI, 2002.

3. Stallings W., "SNMP, SNMPv2, SNMPv3, RMON 1 & 2", 3rd Ed., Addison Wesley, 1999.

3. Laurra Chappell (Ed), "Introduction to Cisco Router Configuration", Techmedia, 1999.

Data Mining & Data Warehousing(MTCSCS 103)

UNIT 1: Introduction to Data Mining, Importance of Data Mining, Data Mining functionalities, Classification of Data mining systems, Data mining architecture, Major Issues in Data Mining, Applications of Data Mining, Social impacts of data mining. Data Preprocessing, Data cleaning, Data Integration and Transformation, Data reduction, Discretization and Concept Hierarchy Generation.

UNIT 2: Introduction to Data Warehouse and OLAP Technology for Data Mining, Multidimensional data Model, Data warehouse Data Model, Data warehouse Architecture, Data warehouse Implementation, Development of Data Cube Technology, From Data warehousing to Data Mining.

UNIT 3: Data Mining primitives, Languages and System Architectures, Concept description: Characterization and Comparison, Analytical Characterization, Mining Class Comparison.

UNIT 4: Association Rule Mining, Mining of Single dimensional Boolean association rules, Multilevel association rules and Multidimensional association rules, Correlation Analysis, Constraint based association Mining. Classification and Predication: Basic issues regarding classification and predication, Classification by Decision Tree, Bayesian classification, and classification by back propagation, Associative classification, Prediction, Classifier accuracy.

UNIT 5: Cluster Analysis, basic issues, clustering using partitioning methods, Hierarchical methods, Density based methods, Grid based methods and model based methods, Algorithms for outlier analysis. Mining complex Types of data: Multidimensional analysis and descriptive mining of complex data objects, Introduction to spatial mining, multimedia mining, temporal mining, text mining and web mining with related algorithms.

Reference Books:

1. Data Mining concepts and Techniques by Jiawei Han, Micheline Kamber –Elsevier.
2. Data Mining by Arun K. Pujari – University Press.
3. Mordern Data Warehousing, Data Mining and Visualization by George M. Marakas–Pearson.
4. Data Mining by Vikram Puri And P.RadhaKrishana –Oxfrod Press.
5. Data Warehousing by Reema Theraja –Oxford Press

Distributed Computing (MTCSCS 104A)

UNIT 1: Architectural models for distributed and mobile computing systems. Basic concepts in distributed computing such as clocks, message ordering, consistent global states, and consensus. Basic Algorithms in Message: Passing Systems, Leader Election in Rings, and Mutual Exclusion in Shared Memory, Fault-Tolerant Consensus, Causality and Time. Message Passing: PVM and MPI.

UNIT 2: Distributed Operating Systems:OS and network operating systems, Distributed File systems. Middleware, client/server model for computing, common layer application protocols (RPC, RMI, streams), distributed processes, network naming, distributed synchronization and distributed object-based systems.

UNIT 3: Simulation:A Formal Model for Simulations, Broadcast and Multicast, Distributed Shared Memory, Fault-Tolerant Simulations of Read/Write Objects Simulating Synchrony, Improving the Fault Tolerance of Algorithms, Fault-Tolerant Clock Synchronization.

UNIT 4: Distributed Environments: Current systems and developments (DCE, CORBA, JAVA). Advanced Topics: Randomization, Wait-Free Simulations of Arbitrary Objects, Problems Solvable in Asynchronous Systems, Solving Consensus in Eventually Stable Systems, High Performance Computing-HPF, Distributed and mobile multimedia systems. Adaptability in Mobile Computing. Grid Computing and applications. Fault tolerant Computing Systems.

UNIT 5: Parallel Processing:Basic Concepts: Introduction to parallel processing, parallel processing terminology, Parallel & Distributed Programming: Parallel Programming environments

Text Books:

1. Tannenbaum, A, Van Steen. Distributed Systems, Principles and Paradigm, Prentice Hall India, 2002
2. Tannenbaum, A. Distributed Operating Systems, Pearson Education. 2006
3. Attiya, Welch, “Distributed Computing”, Wiley India, 2006

Reference Books:

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, “Introduction to parallel computing”, 2nd Edition, Pearson Education, 2007

2. Cameron Hughes, Tracey Hughes, "Parallel and distributed programming using C++", Pearson Education, 2005
3. Tanenbaum, A, "Modern Operating Systems", 2nd Edition, Prentice Hall India, 2001.
4. Singhal and Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill, 1994
5. Michael J. Quinn, "Parallel Computing – Theory and Practice, 2nd Edition, McGraw Hill, 1994

Advanced Topics In Algorithms (MTCSCS 104B)

Unit 1:Advanced data structures: Self adjustment tree (splay tree),Red- black tree, operations on Red-Black Trees. Weight Balanced Trees (Huffman Trees), Augmenting Red-Black Trees to Dynamic Order Statics and Interval Tree Applications, 2-3 Trees .

Unit 2: Parallel algorithms: Basic techniques for sorting, searching, merging, list ranking in PRAMs and Interconnection networks.

Unit 3: Geometric algorithms: Point location, convex hulls and Voronoi diagrams, Arrangements.

Unit 4: Graph algorithms: Isomorphism Components, Algorithms for Connectness, Finding all Spanning Trees in a Weighted Graph,Cut-sets. Cut-Vertices Planer and Dual graphs,Spanning Trees ,strongly Connected Components and Aritculation Point. Single source shortest path and all pair shortest path algorithms. Min-Cut Max- Flow theorem of Network Flows. Ford-Fulkerson Max Flow Algorithms.

Unit 5: Approximation algorithms: Use of Linear programming and primal dual, local search heuristic.

Recommended Books :

1. Cormen-Introduction to Algorithms,Prentice Hall of India.
2. Aho A.V.,Hopcrptt J.E. and Ullman J.D.-The Design and Analysis of Computer Algorithms, Pearson Education.
3 horowitz and sahni ,data structure and algorithms .
4. Baase-Computer Algorithms,pearson Education.
5-Fundamentals of Data Structures Galgotia Book Source.

Advanced Compilation Techniques (MTCSCS104C)

Unit I: Generic Code Optimization Techniques - loop optimization, inlining, and other transformations.

Unit II: Impact of architectures on code generation and optimization: RISC architectures, VLIW architectures, special-purpose architectures.

Unit III: Architecture- specific code optimizations – register allocation (coloring, allocation, live range splitting), instruction scheduling (pipelined architectures, delayed load architectures, list scheduling). Code Optimizations under real-time / embedded constraints – cacheless / diskless memory models, bounded time responses.

Unit IV: Garbage Collection Techniques – automatic memory management and data locality. Virtual Machines and Just-in-Time Compilation techniques - HotSpot-like optimizations.

Unit V: Implementation of exception handling, concurrency, and generic jumps (like call/cc).

Text Books:

1) Steven Muchnick, *Advanced Compiler Design Implementation,* Morgan Kaufmann.
2) Keith D Cooper and Linda Torczon, *Engineering a Compiler,* Morgan Kaufmann.

Reference Books:

1) Aho, Lam, Sethi and Ullman, *Compilers: Principles, Techniques and Tools, 2/E* Addison-Wesley, 2007.
2) Randy Allen & Ken Kennedy, *Optimizing Compilers for Modern Architectures,* Morgan Kaufmann.
3) Michael Wolfe, *High Performance Compilers for Parallel Computing,*, Addison-Wesley.

Advanced Communication Network (MTCSCS105)

1. Write two programs in C: hello_client and hello_server

• The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection

• The client connects to the server, sends the string “Hello, world!”, then closes the Connection

2. Write an Echo_Client and Echo_server using TCP to estimate the round trip time from client to the server. The server should be such that it can accept multiple connections at any given time.

3. Repeat Exercises 1 & 2 for UDP.

4. Repeat Exercise 2 with multiplexed I/O operations

5. Simulate Bellman-Ford Routing algorithm in NS2

6. Write client/server applications involving unix sockets involving TCP or UDP involving iterative or concurrent server.

7. Understand IPV4 & IPV6 interoperability issues.

SEMESTER II

Theory Papers

Code	Title Of Subject	L	P	T	IA	EA	Total	Credits
MTCSCS201	Distributed Algorithms	3	0	1	50	100	150	4
MTCSCS202	Cloud Computing	3	0	1	50	100	150	4
MTCSCS203	Real Time Systems	3	0	1	50	100	150	4
Electives (Any One)								
MTCSCS204A	Artificial Intelligence	3	0	1	50	100	150	4
MTCSCS204B	Advanced Database Systems	3	0	1	50	100	150	4
MTCSCS204C	Multimedia Computing	3	0	1	50	100	150	4
Practical/Viva Voce								
		L	**P**	**T**	**Sessional**	**Practical**	**Total**	**Credits**
MTCSCS 205	Cloud Computing Lab	0	2	0	60	40	100	1
Total		**12**	**02**	**4**	**260**	**440**	**700**	**17**

DISTRIBUTED ALGORITHMS (MTCSCS201)

Objective: The purpose of the Distributed Algorithms course is to provide students with an understanding of the main problems and techniques in the design and implementation of distributed systems.

UNIT I: Course overview. Synchronous networks. Leader election in synchronous ring networks. Leader election in rings. Basic computational tasks in general synchronous networks: leader election. Breadth-first search. Broadcast and convergecast. Shortest paths. Spanning trees. Minimum spanning trees. Fault-tolerant consensus. Link failures: the two generals problem. Process failures (stopping, Byzantine). Algorithms for agreement with stopping and Byzantine failures. Exponential information gathering. Number-of-processor bounds for Byzantine agreement. Weak Byzantine agreement. Time bounds for consensus problems. *k*-set-agreement. Approximate agreement. Distributed commit.

UNIT II: Asynchronous distributed computing. Formal modeling of asynchronous systems using interacting state machines (I/O automata). Proving correctness of distributed algorithms. Non-fault-tolerant algorithms for asynchronous networks. Leader election, breadth-first search,

shortest paths, broadcast and convergecast. Spanning trees. Gallager *et al*. minimum spanning trees.

UNIT III: Synchronizers. Synchronizer applications. Synchronous vs. asynchronous distributed systems. Time, clocks, and the ordering of events. State-machine simulation. Vector timestamps. Stable property detection. Distributed termination. Global snapshots. Deadlock detection. Asynchronous shared-memory systems. The mutual exclusion problem. Mutual exclusion algorithms. More mutual exclusion algorithms. Bounds on shared memory for mutual exclusion. Resource allocation. The Dining Philosophers problem.

UNIT IV: Shared-memory multiprocessors. Contention, caching, locality. Practical mutual exclusion algorithms. Reading/writing locks. Impossibility of consensus in asynchronous, fault-prone, shared-memory systems. Atomic objects. Atomic snapshot algorithms. Atomic read/write register algorithms.

UNIT V: List algorithms: locking algorithms, optimistic algorithms, lock-free algorithms, lazy algorithms. Transactional memory: obstruction-free and lock-based implementations. Wait-free computability. The wait-free consensus hierarchy. Wait-free vs. *f*-fault-tolerant atomic objects. Boosting fault-tolerance. Asynchronous network model vs. asynchronous shared-memory model. Impossibility of consensus in asynchronous networks. Failure detectors and consensus. Paxos consensus algorithm. Self-stabilizing algorithms.

Text Books:

- Nancy Lynch, "Distributed Algorithms" Morgan Kaufmann.
- Gerlad Tel, "Introduction to Distributed Algorithms" Cambridge University Press.

CLOUD COMPUTING (MTCSCS202)

UNIT – I: Evolution of computing paradigms, Introduction to virtualization and virtual machine, Virtualization in fabric/cluster/grid context, Virtual network, Information model & data model for virtual machine, Software as a Service (SaaS), SOA, On Demand Computing.

UNIT – II: Cloud Computing: History; An introduction to characteristics, service models, deployment models, benefits, and challenges; Cloud software architecture issues, Cloud Computing with Titans: Google App Engine, Microsoft Windows Azure, Comparison of Google App Engine and Windows Azure; Cloud Infrastructure Models & Cloud Scale.

UNIT – III: Migrating to the Cloud, Software Licenses, Cloud Cost Model, Service Levels for Cloud Applications; Security: Disaster Recovery, Web Application Design, Machine Image Design, Privacy Design, Database Management, Data Security, Network Security, Host Security.

UNIT – IV: Service Models: Storage-as-a-Service, Database-as-a-Service, Information-as-a-Service, Process-as-a-Service, Application-as-a-Service, Platform-as-a-Service, Integration-as-a-Service, Security-as-a-Service, Management/Governance-as-a-Service, Testing-as-a-Service, Infrastructure-as-a-Service.

UNIT – V: Cloud Disaster Management: Disaster Recovery, Planning; Types of Clouds, Cloud Centres, Comparing approaches: Xen, OpenNebula, Eucalyptus, Amazon, Nimbus.

Text Books:

1. Cloud Computing: A Practical Approach – **Toby Velte**, McGraw Hill.
2. Cloud Computing: Web Based Applications That Change the way you Work and Collaborate Online – **Michael Miller**, Pearson Education.
3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud (Theory in Practice) - **George Reese**, 1st Edition, O'Reilly Media.

Reference Book:

1. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide - **David S. Linthicum** Addison-Wesley Professional.
2. Enterprise Web 2.0 Fundamentals - **Krishna Sankar; Susan A. Bouchard**, Cisco Press

Real Time Systems (MTCSCS203)

Unit I: Introduction to Real-time computing: Characterizing Real-time System and Tasks; Real-Time Applications, Hard versus Soft Real-Time Systems; Parameters of Real-Time Workload – Temporal Parameters and Functional Parameters.

Unit II: Performance measures of real time systems, estimation of program run time, Real-time system design: Hardware requirement, system development cycle, data transfer techniques, synchronous & asynchronous data communication, standard interfaces;

Unit III: Task assignment and scheduling: Priority scheduling, scheduling with fixed priority, dynamic priority scheduling;

Unit IV: Real-time programming languages & tools: desired language characteristics, data typing, control structure, run time error handling, overloading and generics, run time support; Real-time databases: Real-Time vs. General-Purpose databases, Transaction Priorities, Concurrency Control Issues.

Unit V: Real time communication algorithms, Fault tolerance techniques: Causes of failure, fault types, fault detection, redundancy, integrated failure handling; Reliability Evaluation techniques: Parameter values, reliability model for hardware redundancy, software error model.

Reference Books:

1. C.M. Krishna, Kang G. Shin, “Real Time Systems”, McGraw-Hill International Editions.
2. Jane W. S. Liu, “Real Time Systems”, Pearson Education.
3. Mathai Joseph, “Real Time Systems: Specification, Verification & Analysis”, Prentice Hall Inc.
4. Stuart Bennet, “Real Time Computer Control”, Prentice Hall Inc.
5. S.J. Young, “Real Time Languages”, John Wiley & sons.

Artificial Intelligence (MTCSCS204A)

Unit :I AI Techniques

Meaning and definition of artificial intelligence, Application of AI, Turing Test Machine, Various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search Techniques, other Search Techniques like hill Climbing Simple and Steepest Ascent Hill Climbing, Greedy or Best first Search. A* algorithm, AO* algorithmsEtc.

Unit :II Knowledge Representation

Knowledge Representation, Declarative and Procedural Knowledge, Symbolic Logic : knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, reasoning, monotonic and nonmonotonic reasoning. Forward and backward reasoning.

Unit :III Learning and Expert System

Introduction to learning, Various techniques used in learning (Supervised, Unsupervised, Reinforcement Learning), introduction to neural networks, applications of neural networks, Expert System, Building Block Diagram of Expert System , some example of expert systems. Applications of Expert System.

Unit :IV Game Playing Techniques and NLP

Game playing techniques like minimax Search procedure, alpha-beta cut-offs etc.. Introduction to understanding and natural languages processing.Steps in NLP Process.

Unit :V Fuzzy System

Introduction to Neuro-Fuzzy and Soft Computing,Fuzzy Set Theory,Fuzzy Rules ,Fuzzy Inference Systems. semantic networks, scripts schemas, frames, conceptual dependency and fuzzy logic.

Text Books & References:

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
2. Introduction to AI & Expert System: Dan W. Patterson, PHI.
3. Artificial Intelligence by Luger (Pearson Education)
4. Russel & Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall

ADVANCED DATABASE MANAGEMENT SYSTEM (MTCSCS204B)

Unit I

Basic concepts: Database & database users, characteristics of the database, database systems, concepts and architecture, date models, schemas & instances, DBMS architecture & data independence, database languages & interfaces, data modeling using the entity relationship approach. Overview of hierarchical, Network & Relational Data Base Management Systems.

Unit II

Relational model, languages & systems: Relational data model & relational algebra: relational model concepts, relational model constraints, relational algebra, SQL- a relational database language: date definition in SQL, view and queries in SQL, specifying constraints and indexes in sql, a relational database management systems.

Unit III

Oracle Architecture, Logical Data Structures Physical Data Structure, Instances, Table Spaces, Types of Tablespaces, Internal Memory Structure, Background Processes, Data Types, Roles & Privileges, Stored Procedures, User Defined Functions, Cursors, Error Handling, Triggers.

Unit IV

Relational data base design:

Function dependencies & normalization for relational dataases: functional dependencies, normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF), lossless join and dependency preserving decomposition.

Unit V

Concurrency control & recovery techniques: Concurrency control techniques, locking techniques, time stamp ordering, granularity of data items, recovery techniques: recovery concepts, database backup and recovery from catastrophic failures. Concepts of object oriented database management systems, Distributed Data Base Management Systems.

Text Books:

1. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006

2. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007

Reference Books:

1. Date, Kannan, Swaminathan, “An Introduction to Database Systems”, 8th Edition Pearson Education, 2007
2. Singh S.K., “Database System Concepts, design and application”, Pearson Education,2006
3. Ullman, J. D., “Principals of database systems”, Galgotia publications, 1999

Multimedia Computing (MTCSCS204C)

UNIT I . Introduction,Uses of multimedia information,Historical background,Survey of hardware,Graphic boards and accelerators,Sound boards,Video capture boards,Magnetic and optical storage devices, DVD. Blu-Ray, HD-DV (macrovision, VCDs, SVCDs, VOBs, ripping techniques),Survey of software ,Graphic standards, Music computer formats,Video computer standards,Gaming,Authoring Systems

UNIT 2. Multimedia Platforms (QuickTime, MCI, Video for Windows, Activemovie, Direct-X), Multimedia Programming (Java, Active-X, MCI, Windows Foundation Classes), The creative process: hardware, software, development team and methodology,Media Types – Media Objects (Implementations and methods)

- A. Text
  - 1. Encoding – ASCII, Unicode
  - 2. Formatting – in-line (.dot notation, HTML, SGML)
  - 3. Page description languages – Adobe pdf
- B. Image
  - 1. Bit mapped vs. vector based representations
  - 2. Color Space Representations – RGB, CMY, HSU
  - 3. CLUTs
  - 4. Color depth and resolution
  - 5. Image File Formats BMP, GIF, JPEG, PNG, TIFF
  - 6. Editing tools and effects (pixel methods, masking, morphing, etc.)
- C. Graphics – Internal and external modeling techniques, mapping, lighting, viewing and rendering
- D. Audio

- 1. The physics of sound
- 2. Sound fields, the environment and acoustics – multi-channel/surround sound
- 3. Quantization and sampling rate
- 4. The Nyquist theorem
- 5. Audio formats
- 6. Digital encoding (PCM, ADPCM, A-law/m-law
- 7. Digital Audio Effects & Filtering

- E. Music – MIDI, SMDL
- F. Video – analog, digital and broadcast
  - 1. Luminance and Chrominance representations
  - 2. Fields, frames and interlacing
  - 3. Color encoding (Camera, transmission and receiver: RGB, YUV, YIQ, YCbCr)
  - 4. RF, Composite, S-Video and Component video
  - 5. NTSC and HDTV
  - 6. Editing techniques (traditional vs. NLE systems)
  - 7. Transitions, keying, and scaling
  - 8. Storage and distribution
- G. Animation – Modeling & Rendering
- H. Video Conferencing
- I. Other Media types (speech, digital ink, virtual reality)

UNIT 3. Multimedia and the Internet, WWW, Web browsers, HTML, VRML, CGI, Active-X and Java, System survey (multimedia examples taken from science, entertainment, gaming, etc.)

UNIT 4: Design issues,System design issuesImplementation issues,Usability evaluation,Compression Techniques,Requirements,Basic information theory(1. Entropy vs. energy, Shannon's equation, Entropy vs. source encoding)

UNIT 5: JPEG and the DCT,MPEG file structure and I-, P-, B-frames, Practical compression techniques, mp3, DivX, MPEG-4

TEXT BOOKS

1. Multimedia:Making It Work - Tay Vaughan
2. Fundamental of Multimedia - Ze-Nian Li & M. S. Drew
3. Multimedia Systems Design - Prabhat k.Andleigh, Kiran Thakra
4. Multimedia Systems - John F.Koegel Buford

REFERENCES

1. Computer Graphics Multimedia and Animation - Malay K. Pakhira PHI , New Delhi - Second edition
2. Principles of Multimedia - Ranjan Parekh - TMGH, New Delhi - Twelfth Reprint,
3. Computer Graphics and Multimedia - Anirban Mukhapathyay, Aruop Chattopadhyay - Vikas Publishing Ltd - Second Edition
4. Multimedia Technology & Applications- David Hillman Galgotia Publications Pvt Ltd.- Second Edition

Cloud Computing (MTCSCS205)

List of Experiments

1.Working of Goggle Drive to make spreadsheet and notes.

2.Installation and Configuration of Justcloud.

3.Working in Cloud9 to demonstrate different language.

4.Working in Codenvy to demonstrate Provisioning and Scaling of a website

5.Installation and Configuration of Hadoop/Eucalyptus.

6.Working and installation of Google App Engine.

7.Working and installation of Microsoft Azure.

8.Working with Mangrasoft Aneka Software.

SEMESTER III

Theory Papers

Code	Title Of Subject	L	P	T	IA	EA	Total	Credits
MTCSCS301	E-Business Systems	3	0	1	50	100	150	4
MTCSCS302	Soft computing	3	0	1	50	100	150	4
MTCSCS303	Information System Security	3	0	1	50	100	150	4
Electives (Any One)								
MTCSCS304A	Grid Computing	3	0	1	50	100	150	4
MTCSCS304B	Parallel Computing	3	0	1	50	100	150	4
MTCSCS304C	Object Oriented Analysis and Design	3	0	1	50	100	150	4
Practical/Viva Voce								
		L	P	T	Sessional	Practical	Total	Credits
MTCSCS305	Seminar	0	-	-	60	40	100	2
Total		**12**	**00**	**4**	**260**	**440**	**700**	**18**

E-BUSINESS SYSTEMS (MTCSCS301)

Unit I

Overview of e-Business: Definition, Business Process, Moving from e-commerce to e-business, advantages and disadvantages; trends and forces driving e-business, comparative study of e-commerce and e-business; E-commerce models; E-business models; e-business communities; E-business Design steps; External and internal information systems, networks, or technical infrastructures that enable e-business.

Unit II

Customer Relation Management (CRM): Introduction to CRM - definition and overview, role and importance of CRM; CRM architecture, Supporting requirements of the next-generation CRM infrastructure, Challenges in CRM implementation, Next-generation CRM trends.

Unit III

Selling-Chain Management: Deriving forces for Selling-Chain management, Managing the order acquisition process, Elements of Selling-Chain infrastructure.

Supply Chain Management (SCM): Defining SCM, Basics of Internet-Enabled SCM, e-Supply chain fusion, Manager's roadmap for SCM.

Unit IV

E-Procurement: Purchasing versus procurement, Operating resource procurement, e-Procurement chain management, Next generation integrated procurement applications, Elements of Buy-Side e-Procurement solutions, Elements of Sell-Side e-Procurement solutions.E-Logistics; Data Warehousing for e-business.

Unit V

Challenges of e-Business strategy creation; e-Business blueprint creation; Online Business with technology - Internet, Intranet, Extranet, Internet Protocols; E-commerce Applications: Issues and Prospects - Buying and paying online, Electronic Payment, E-banking, E-tailing, Security in e-Business.

Reference Books:

1. Ravi Kalakota and Marcia Robinson; e-Business- Roadmap for Success; Pearson Education Asia Pte Ltd, Tecmedia, New Delhi.
2. H. Albert Napier, Philip J. Judd, Ollie Rivers, Stuart W. Wagner; Creating a Winning E-Business; Vikas Publishing House Pvt. Ltd., New Delhi.

SOFT COMPUTING(MTCSCS302)

Objective: To understand the various concepts of neural networks and fuzzy logic and soft Computing algorithms.

UNIT-I

Neural Networks:

History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

UNIT-II

Fuzzy Logic:

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation, Operations.

UNIT-III

Fuzzy Arithmetic:

Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers,

Uncertainty based Information:

Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets.

UNIT-IV

Introduction of Neuro-Fuzzy Systems:

Architecture of Neuro Fuzzy Networks.

Application of Fuzzy Logic:

Medicine, Economics etc.

UNIT V

Algorithm:

An overview of Genetic Algorithm, Artificial Bee Colony Algorithm, Ant Colony Algorithm etc. Applications and implementation of these algorithms.

Text Books:

- Hertz J. Krogh, R.G. Palmer, "Introduction to the Theory of Neural Computation", Addison-Wesley, California, 1991.
- G.J. Klir & B. Yuan, "Fuzzy Sets & Fuzzy Logic", PHI, 1995.
- Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.
- F. O. Karray and C. de Silva, "Soft computing and Intelligent System Design", Pearson, 2009.

- “Neural Networks-A Comprehensive Foundations”, Prentice-Hall International, New Jersey, 1999.
- Freeman J.A. & D.M. Skapura, “Neural Networks: Algorithms, Applications and Programming Techniques”, Addison Wesley, Reading, Mass, (1992).

INFORMATION SYSTEM SECURITY (MTCSCS303)

Unit I

Multi level model of security, Cryptography, Secret Key Cryptography, Modes of Operation, Hashes and Message Digest, Public Key Algorithm, Security Handshake Pitfall, Strong Password Protocol; Case study of real time communication security;

Unit II

Introduction to the Concepts of Security, Security Approaches, Principles of security, Types of attacks; Cryptographic Techniques: Plain text and Cipher text, Substitution Techniques, Transposition Techniques Encryption and Decryption, Symmetric and Asymmetric Key Cryptography. Computer-based symmetric Key Cryptographic;

Unit III

Algorithms: Algorithm Types and Modes, An Overview of Symmetric Key Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (IDEA), Advanced Encryption Standard (AES);

Computer-based Asymmetric Key Cryptographic Algorithms; Cryptography, An Overview of Asymmetric Key Cryptography, The RSA algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm;

Unit IV

Public Key Infrastructure (PKI) Digital Certificates, Private Key Management , The PKI Model, Public Key Cryptography Standards (PKCS); Internet Security Protocols Secure Socket Layer (SSL) , Secure Hyper Text Transfer Protocol (SHTTP) , Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), SSL versus SET, 3-D Secure Protocol , Electronic Money , Email Security;

Unit V

User Authentication Mechanisms : Authentication Basics, Passwords, Authentication Tokens, Certificate-based Authentication; Practical Implementations of Cryptography/Security: Cryptographic Solutions Using Java, Cryptographic Solutions Using Microsoft, Cryptographic Toolkits, Security and Operating Systems; Network Security: Brief Introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks (VPN); Case Studies on Cryptography and Security:

Reference Books:

1. Atul Kahate "Cryptography and Network Security" Tata McGraw-Hill
2. Charlie Kaufman,Radia Perlman,Mike Speciner" Network Securities" Pearson,

GRID COMPUTING (MTCSCS304A)

Unit I

Introduction: Definition of Grid, history and evolution of Grid Computing, Virtual Organizations, Computational Grid projects around the world, Grid challenges, Grid organizations, Potential users and techniques for use of grids, Grid requirements of end users, application developers, tool developers, grid developers, and system managers. Service Oriented Architecture (SOA), Issues in Management of Grid Models.

Unit II

Architecture: Components of Layered Grid Architecture, Open Grid Services Architecture (OGSA), Grid architecture models, Grid Resource Information Service (GRIS). Resource infrastructure.

Grid Middleware: Globus: Overview, resource specification language, information services, Globus Resource Allocation Manager (GRAM), job submission with managed-job-globusrun, security, scheduling, Grid FTP protocol, overview of other middleware like Condor, Condor-G.

Unit III

Resource Management and Scheduling: Resource Discovery and Information Services, Information directory services, schedulers and resource brokers, Characterization of resource management problems based on job requirements, algorithms, tools and sample resource management systems, Monitoring, Scheduling, Performance tuning, Debugging and performance diagnostic issues.

Grid Security: Grid security demands and solutions; authentication, authority, assurance, accounting, trust, group communication for large-scale, dynamic, multi-organization environments.

Unit IV

Grid Portals: Functionality and underlying infrastructure for sample general and application specific portals. **Data Management**: Key issues for data management in Grids, including file transfer, data replication, data caching issues, catalog issues.

Unit V

Case Studies: Seti project, Sun Grid engine, EuroGrid and some other national grid projects.

Advanced Topics: Overview of: Grid simulation, Grid Economy, Semantic Grid, Autonomic Grid, Cloud Computing.

Reference Books

1. Peter Pacheco "Parallel Programming with MPI". Morgan Kaufmann.

2. Ian Foster and Carl Kesselman."The Grid: Blueprintf for a New Computing Infrastructure", Morgan Kaufmann.

Parallel Computing (MTCSCS304B)

Unit -1 Introduction to Parallel Processing:

Supercomputers and grand challenge problems, Modern Parallel Computers, Data Dependence Graph, Data Parallelism, Functional Parallelism, Pipelining and Data Clustering.

Unit -2 Interconnection Networks:

Switch Network Topologies, Direct and Indirect Network Topology, Bus, Star, Ring, Mesh, Tree, Binary Tree Network, Hyper Tree Network, Hybrid, Hypercube, Perfect Shuffle Network, Torus and Butterfly Network.

Unit-3 Performance Analysis:

Introduction, Execution Time, Speedup, Linear and Superliner Speedup, Efficacy and Efficiency, Amdahl's Law and Amdahl Effect, Gustafson-Barsis's Law, Minsky's Conjecture, The Karp-Flat Metric, The Isoefficiency Metric, Isoefficiency Relation, Cost and Scalability.

Unit-4 Parallel Computational Models:

Flynn's Taxonomy, PRAM, EREW, CREW, ERCW, CRCW, Simulating CRCW, CREW and EREW, PRAM algorithms.

Unit-5 Introduction to Parallel Algorithms:

Parallel Programming Models, PVM, MPI Paradigms, Parallel Programming Language, Brent's Theorem, Simple parallel programs in MPI environments, Parallel algorithms on network, Addition of Matrices, Multiplication of Matrices.

Text Books and References:

1. Hwang and Briggs, advance Computer Architecture and Parallel Processing, McGraw Hill.
2. Crichlow, Introduction to Distributed and Parallel Computing, PHI.
3. M.J.Quinn, Designing Efficient Algorithms for Parallel Computers, McGraw-Hill.
4. V.Rajaraman, Elements of Parallel Computing, Prentice-Hall of India.
5. Joseph JA JA, Introduction to Parallel Algorithms, Addison Wesley.
6. S.G.Akl, The Design and Analysis of Parallel Algorithms, PHI.
7. Shashi Kumar M et al. Introduction to Parallel Processing, PHI New Delhi.

Object Oriented Analysis and Design(MTCSCS304C)

UNIT I: Introduction to UML

Introduction to UML : Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT II: Basic and Advanced Structural Modeling

Basic Structural Modeling : Classes, Relationships, common Mechanisms, and diagrams.

Advanced Structural Modeling : Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

UNIT III: Class & Object Diagrams,Class & Object Diagrams : Terms, concepts, modeling techniques for Class & Object Diagrams. Basic Behavioral Modeling-I,Basic Behavioral Modeling-I : Interactions, Interaction diagrams.

UNIT IV: Basic Behavioral Modeling-II,Basic Behavioral Modeling-II : Use cases, Use case Diagrams, Activity Diagrams,Advanced Behavioral Modeling : Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT V: Architectural Modeling : Component, Deployment, Component diagrams and Deployment diagrams.

TEXT BOOKS:

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

REFERENCE BOOKS:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.

MTCSCS305 Seminar

MTCSCS 401 Dissertation