MAHATMA GANDHI UNIVERSITY

SCHEME AND SYLLABI

FOR

M.TECH DEGREE PROGRAMME

IN

COMPUTER SCIENCE AND ENGINEERING

(2011 ADMISSION ONWARDS)

SCHEME AND SYLLABI FOR M.Tech DEGREE PROGRAMME IN COMPUTER SCIENCE AND ENGINEERING

SEMESTER – I

Sl. No.	Course No.	Subject	Hrs / Week			Evaluation Scheme (Marks)					Credits (C)
			L	T	P	Sessional			ESE	Total	
						TA	CT	Sub Total			
1	MCS* 101	Mathematical Foundations For Computer Science	3	1	0	25	25	50	100	150	4
2	MCS* 102	Distributed Operating Systems	3	1	0	25	25	50	100	150	4
3	MCS* 103	Advanced Data Structures and Algorithms	3	1	0	25	25	50	100	150	4
4	MCS* 104	Parallel Computer Architecture	3	1	0	25	25	50	100	150	4
5	MCSCS 105	Elective - I	3	0	0	25	25	50	100	150	3
6	MCSCS 106	Elective-II	3	0	0	25	25	50	100	150	3
7	MCS* 107	Operating Systems Lab	-	0	3	25	25	50	100	150	2
8	MCSCS 108	Seminar-I	-	0	2	50	-	50	0	50	1
Total			**18**	**4**	**5**			**400**	**700**	**1100**	**25**

Elective – I (MCSCS 105)		Elective – II (MCSCS 106)	
MCSCS 105-1	Mobile Communication Networks	MCS* 106-1	Data Warehousing and Data Mining
MCSCS 105-2	Digital Image Processing	MCSCS 106-2	Embedded Systems
MCSCS 105-3	XML and Web Services	MCSCS 106-3	Object Oriented Software Engineering
MCSCS 105-4	Multimedia Systems	MCSCS 106-4	Information Security

L – Lecture, **T** – Tutorial, **P** – Practical

TA - Teacher's Assessment (Assignments, attendance, group discussion, Quiz, tutorials, seminars, etc.)

CT - Class Test (Minimum of two tests to be conducted by the Institute)

ESE - End Semester Examination to be conducted by the University

MCS* - Subjects common for Computer Science specializations, Computer Science and Engineering / Computer Science and Information Systems

Electives: New Electives may be added by the department according to the needs of emerging fields of technology. The name of the elective and its syllabus should be submitted to the University before the course is offered.

Seminar: Students may select a topic for their seminar preferably in the same area as that of their project

SEMESTER II

Sl. No.	Course No.	Subject	Hrs / Week			Evaluation Scheme (Marks)					Credits (C)
			L	T	P	Sessional			ESE	Total	
						TA	CT	Sub Total			
1	MCS* 201	Modern Computer Networks	3	1	0	25	25	50	100	150	4
2	MCS* 202	Advanced Database Systems	3	1	0	25	25	50	100	150	4
3	MCS* 203	Computer Security and Applied Cryptography	3	1	0	25	25	50	100	150	4
4	MCS* 204	Compiler Design	3	1	0	25	25	50	100	150	4
5	MCSCS 205	Elective-III	3	0	0	25	25	50	100	150	3
6	MCSCS 206	Elective-IV	3	0	0	25	25	50	100	150	3
7	MCS* 207	Network Simulation Lab	-	-	3	25	25	50	100	150	2
8	MCSCS 208	Seminar-II	-	-	2	50	-	50	0	50	1
Total			**18**	**4**	**5**			**400**	**700**	**1100**	**25**

Elective – I (MCSCS 105)		Elective – II (MCSCS 106)	
MCS* 205-1	Neural Networks	MCS* 206-1	Multicore Architecture
MCSCS 205-2	Grid Computing	MCSCS 206-2	Parallel Computation and Applications
MCSCS 205-3	Software Testing	MCSCS 206-3	Real Time Systems
MCSCS 205-4	Component Based Technology	MCSCS 206-4	Information Storage and Management

L – Lecture, **T** – Tutorial, **P** – Practical

TA - Teacher's Assessment (Assignments, attendance, group discussion, Quiz, tutorials, seminars, etc.)

CT - Class Test (Minimum of two tests to be conducted by the Institute)

ESE - End Semester Examination to be conducted by the University

MCS* - Subjects common for Computer Science specializations, Computer Science and Engineering / Computer Science and Information Systems

Electives: New Electives may be added by the department according to the needs of emerging fields of technology. The name of the elective and its syllabus should be submitted to the University before the course is offered.

SEMESTER III

Sl. No.	Course No.	Subject	Hrs / Week			Evaluation Scheme (Marks)					Credits (C)
			L	T	P	Sessional			ESE** (Oral)	Total	
						TA*	CT	Sub Total			
1	MCSCS 301	Industrial Training and Mini Project	0	0	20	50	0	50	100	150	10
2	MCSCS 302	Thesis – Phase I	0	0	10	100***	0	100	0	100	5
Total					**30**			**150**	**100**	**250**	**15**

* 50% of the marks to be awarded by the Industrial Training and project guide and the remaining 50% to be awarded by a panel of examiners, including Industrial Training and project guide, constituted by the department.

** Industrial Training and Mini project evaluation will be conducted at end of the third semester by a panel of examiners, with at least one external examiner, constituted by the university

*** The marks will be awarded by a panel of examiners constituted by the concerned institute.

SEMESTER IV

Sl. No.	Course No.	Subject	Hrs / Week			Evaluation Scheme (Marks)					Credits (C)
			L	T	P	Sessional			ESE** (Oral & Viva)	Total	
						TA*	CT	Sub Total			
1	MCSCS 401	Thesis Evaluation	0	0	30	100	0	100	100	200	15
2	MCSCS 402	Master's Comprehensive Viva							100	100	
Total										**300**	**15**
Grand Total of all Semesters										**2750**	**80**

* 50%of the marks to be awarded by the project guide and the remaining 50% to be awarded by a panel of examiners, including project guide, constituted by the department.

** Thesis evaluation and Viva-voce will be conducted at end of the fourth semester by a panel of examiners, with at least one external examiner, constituted by the university.

MCS* 101 MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE

L	T	P	C
3	1	0	4

Module 1 : Fuzzy Mathematics

Crisp sets and Fuzzy sets-, α-cuts, Convex fuzzy sets, Fuzzy cardinality, Algebra of fuzzy sets, Standard fuzzy set operations-(complement, union and intersection), Yager and Sugeno classes. Crisp relations and Fuzzy relations, Operations on Fuzzy relations. Fuzzy Cartesian product. Fuzzy Equivalence relations and similarity relations.

Module 2 : Fuzzy Logic

Fuzzy logic, Fuzzy tautologies and contradictions, equivalence and implication operators (Classical implication, Mamdani implication, Kleene-Dienes implication and Lukasiewicz implication) .Composition operators, Fuzzy quantifiers and predicates, approximate reasoning. Fuzzification and Defuzzification techniques.

Module 3: Stochastic Process

Random variables, Functions of random variables, Sequence of random variables, stochastic processes, Markov chains, Markov processes and queuing theory

Module 4: Queing Models

Queuing Theory-General concepts, Arrival pattern, service pattern, Queue Disciplines –Markovian Queues, Single and Multi-server models. The Markovian model M/M/1-steady state solutions-Little's formula

References:

1. Grimaldi R.P, "Discrete and Combinatorial Mathematics-An applied Introduction", (Addison-Wesley, New Delhi).
2. George J Klir and Tina A Foldger, "Fuzzy sets –Uncertainty and Information", (Prentice-Hall of India).
3. George J Klir and Bo Yuan, "Fuzzy sets and Fuzzy logic", (Prentice-Hall of India).

4. Timothy J. Ross, " Fuzzy logic with Engineering applications", (Wiley-India).
5. Robertazzi T.G, "Computer Networks and systems-Queuing Theory and Performance evaluation", (Springer third edition) .
6. Ross S.M., "Probability Models for Computer Science", (Academic Press).

MCS* 102 DISTRIBUTED OPERATING SYSTEMS

L	T	P	C
3	1	0	4

Module 1: Distributed computing systems fundamentals

Introduction to Distributed computing systems, Models, Popularity. Distributed Computing system. Design issues of Distributed operating system. Distributed computing environment.

Module 2: Message Passing

Features of a good Message Passing System. Issues in IPC by Message Passing Synchronization, Buffering, Multi datagram Messages, Encoding and Decoding Message data, Process Addressing, Failure Handling, Group Communication. RPC Model, Transparency of RPC,RPC messages, Marshaling Arguments and Results. Server Management, Parameter Passing semantics, call semantics, Communication Protocols for RPCs, Client Server Building, Exception handling, Security ,RPC in Heterogeneous Environments, Lightweight RPC.

Module 3: Distributed Shared Memory:

General architecture of DSM systems. Design and implementation Issues of DSM, Granularity, Structure of Shared Memory Space. Consistency models, Replacement strategy, Thrashing. Synchronization: Clock Synchronization. Event Ordering, Mutual Exclusion, Deadlock, Election Algorithms.

Module 4: Resource Management

Features of global scheduling algorithm. Task assignment approach, Load-Balancing and Load approach. Process Management: Introduction, Process Migration, Threads. Distributed File Systems: Features of good DFS, File models, File Accessing models.

References:

1. Pradeep Sinha K., "Distributed Operating Systems concepts and design", PHI learning private limited.
2. Mukesh Singhal, Niranjan G Shivarathri, "Advanced Concepts in Operating systems", Tata Mc Graw Hill Ltd.
3. Coulouris.G, Dollimore J & Kindberg T, "Distributed Systems concepts and design", 4th edition, Pearson Education.

4. Tanenbaum A S, " Modern Operating System", PHI learning private limited, 3rd edition.

MCS* 103 ADVANCED DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	1	0	4

Module 1

Amortized Complexity Analysis. Advanced Structures for Dictionary ADT: Red-Black Trees, Splay Trees. Multidimensional Search Trees: k-d Trees, Point Quad trees. Advanced Structures for Priority Queues: Leftist Trees, Binomial Heaps, Symmetric Min-Max Heaps.

Module 2

Searches in Graphs: DFS, BFS, Connected Components, Bi-connected Components. Activity on Vertex and Activity on Edge Networks. Maximum Flows, Bipartite Matching.

Module 3

Solution of recurrence equations: Substitution Method, Recursion Tree, and Master Method. Divide and Conquer: Selection, Convex Hull, Maximum-sub array problem. Greedy Methods: Container Loading, Continuous Knapsack Problem. Dynamic Programming: 0/1 Knapsack, Traveling Salesperson Problem, Flow Shop Scheduling.

Module 4

Approximation Algorithms: Vertex-Cover Problem, Traveling-Salesman Problem, Set-Covering Problem, Subset-Sum Problem. Introduction to Probabilistic Analysis and Randomized Algorithms.

References:

1. Horowitz E, Sahni S and Mehta D., “Fundamentals of Data Structures in C++”, University Press, Second Edition, 2007.
2. Horowitz E, Sahni S and Rajasekharan S, “Fundamentals of Computer Algorithms”, University Press, Second Edition, 2007.
3. Cormen V C, Leiserson E, Rivset R, and Stein C, “Introduction to Algorithms”, Third Edition, Prentice Hall of India, 2009.
4. Subrahmanian V. S, Morgan Kaufman, “Principles of Multimedia Database Systems”, 1998.

5. Baase S and Gelder A V, “Computer Algorithms – Introduction to Design and Analysis”, Third Edition, Pearson Education, 2000.

MCS* 104 PARALLEL COMPUTER ARCHITECTURE

L	T	P	C
3	1	0	4

Module 1

Basics of Computer Design & Performance Evaluation:-Defining Computer Architecture, Dependability, Quantitative Principles of Computer Design, CPU Performance & its factors, SPEC Benchmarks. Computational model:- Basic computational models, von-Neumann Computation Model.

Module 2

Instruction level Parallelisms:-ILP concepts, Dependencies between instructions, Preserving sequential consistency-ROB, Limitations of ILP. Pipelining: Introduction to pipelining, Instruction pipeline design, Pipeline hazards.

Module 3

Superscalar Processors:-Introduction, Parallel decoding, Superscalar instruction issue, Shelving, Register Renaming, Case Study- Pentium Pro, Power PC 620.

Module 4

The Memory System:- Memory hierarchy, Cache Coherence, Memory Consistency, Cache Performance Issues, Shared Memory Organization. Distributed Systems: Parallel Virtual Machine, Architecture of PVM, Programming model of PVM. Case Study-Intel Duo Core Architecture

References:

1. John L. Hennessy and David A. Patterson, Morgan Kaufmann / Elsevier, "Computer Architecture-A Quantitative Approach", 4th edition,2007.
2. John L. Hennessy and David A. Patterson, Elsevier, "Computer Architecture-Hardware & Software Approach", 3rd Edition,2005.
3. Sima, Fauntain, Kscucle, "Advanced Computer Architecture a design space approach", Pearson Edition, 7th edition, 2009.
4. Kai Hwang, "Advanced Computer Architecture", McGrawHill publication, Edition, 2001.

5. David Culler and Palsingh J, Morgan Kaufmann , “Parallel Computer Architecture”, 1999.
6. http://www.intel.com/technology/itj/2006/volume10issue02/art01_Intro_to_Core_Duo/p02_intro.htm.
7. Sasikumar M. Dinesh Shikhare, Ravi Prakash P, “Introduction to Parallel Processing”, PHI.
8. Salim Hariri, Manesh Parashar, John A, “Tools & Environments for Parallel and Distributed Computing”,Wiley & Sons INC., Publication .

MCSCS 105-1 MOBILE COMMUNICATION NETWORKS

L	T	P	C
3	0	0	3

Module 1

Introduction to mobile communication: Motivations, concepts, and challenges of mobile computing, Types of mobile networks, Wireless communication concepts, modulation and multiplexing techniques classification of wireless networks evolution of cellular communication systems Extended client-server model; peer-to-peer model; mobile agent model; wireless Internet; smart client messaging; mobile data management;. bus and memory architectures, I/O architectures.

Module 2

Software: Principles of disconnected operation: caching, hoarding, etc. Software adaptation and OS support. Resource sharing. OS for embedded devices: PalmOS, WindowsCE, embedded Linux, WAP/WML, J2ME, Windows Mobile and .Net Framework, BREW. Mobile agents, Resource and service discovery, Mobile Java, Mobile Grid and collaborative processing with Jini.

Module 3

Sensor and Actuator: Sensor and actuator networks: Platforms and capabilities, Programming sensor networks, Sensor database: in-network query processing and storage management. Routing and MAC-layer algorithms. Localization and synchronization techniques. Introduction to development with TinyOS.

Module 4

Issues and Applications: Concepts and applications: mobile positioning techniques, GIS, LBS architecture and protocols. Mobility management**:** Handoff and location management concepts: mobility Management in PLMN, mobility management in mobile Internet, mobility management in mobile agent. Mobile Ad hoc Networks (MANETs) and applications Mobile computing middleware**:** Functionalities of mobile computing middleware, tuple-space middleware,context-aware middleware, reflective middleware, publication/subscription middleware, service discovery; disconnected operations.

References:

1. Reza B'Far, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge University Press, 2005.
2. Schiller J., "Mobile Communications", Pearson Education, 2nd edition, 2003.
3. Evaggelia Pitoura and George Samaras, "Data Management for Mobile Computing", Kluwer Academic Publishers, 1998.
4. Riggs R., Taivalsaari A., VandenBrink M., "Programming Wireless Devices with Java2 Platform", Micro Edition, Addison-Wesley, 2001.
5. Deitel H.M., Deitel P.J., Nieto T.R., and Steinbuhler K., "Wireless Internet & Mobile Business – How to Program", Prentice Hall, 2002.
6. Riggs R., Taivalsaari A., VandenBrink M., "Programming Wireless Devices with Java2 Platform, Micro Edition", ISBN: 0-201-74627-1, Addison-Wesley, 2001.
7. Mark Beaulieu, "Wireless Internet, Applications and Architecture", ISBN: 0-201-73354-4, Addison -Wesley, 2002.

MCSCS 105-2 **DIGITAL IMAGE PROCESSING**

L	T	P	C
3	0	0	3

Module 1

Fundamentals of Image Processing: Introduction – Steps in Image Processing Systems -Elements of visual perception, Image Acquisition – Sampling and Quantization – Pixel Relationships. Transformations and Spatial Filtering: Basic Intensity Transformation Functions -Histogram Processing - Spatial Filtering – Smoothing and Sharpening Filters.

Module 2

Filtering in Frequency Domain- Preliminary Concepts, DFT, FFT, DCT, Smoothing and Sharpening filters – Selective Filtering. Image Restoration and Segmentation: Noise models, Restoration of Noise and Periodic Noise reduction - Detection of Point, Line and Edge- Thresholding – Region Based Segmentation – Motion Segmentation.

Module 3

Multi Resolution Processing: Image Pyramids – Image Pyramids – Subband Coding – The Haar Tranform Multiresolution Expansions – Wavelet Transforms, Fast Wavelet transforms, Wavelet Packets.

Image Compression: Fundamentals – Models – Lossless (Error Free Compression) – Lossy Compression – Compression Standards .

Module 4

Applications of Image Processing: Representation and Description, Object Recognition-Image Understanding – Image Classification –Motion Analysis – Steganography – Colour Image Processing. – Digital Image Watermarking.

References:

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Pearson Education, Third Edition, 2008.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Brooks Cole, Third Edition, 2008.
3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall India, 2007.

4. Madhuri A. Joshi, “Digital Image Processing: An Algorithmic Approach”, Prentice-Hall India, 2006.
5. Rafael C.Gonzalez , Richard E.Woods and Steven L. Eddins, “Digital Image Processing Using MATLAB”, Pearson Education, First Edition, 2004.
6. Abhishak Yadav, Poonam Yadav, “Digital Image Processing”, University Science Press, First Edition, 2009.

MCSCS 105-3 **XML AND WEB SERVICES**

L	T	P	C
3	0	0	3

Module 1

XML: Extending the Enterprise - Role of XML – XML language basics - XML and the Web – SOAP – Web Services –.NET and J2EE - Revolutions of XML – Design principles – The W3C XML Technology family: XML technologies – Name Spaces – Structuring with schemas – Presentation technologies –Transformation – XML Infrastructure technologies.

Module 2

SOAP: Overview of SOAP – HTTP – XML-RPC – SOAP: protocol – overview – message structure – message paths - intermediaries – actors – design patterns - faults – SOAP with attachments.

Module 3

Web Services: Overview – web services technologies - UDDI – WSDL – ebXML – ebXML technologies - SOAP, web services, and e-commerce – .NET and J2EE - .NET – J2EE

Module 4

XML security: security overview – canonicalization – XML security framework – XML encryption – XML digital signature – XKMS - guidelines for signing XML documents – XML in practice: The dimensions of XML in practice – XML application spectrum – wave one – wave two – the third wave.

References:

1. Frank. P. Coyle, XML, “Web Services and The Data Revolution”, Pearson Education, 2002.
2. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, “Developing Java Web Services”, Wiley Publishing Inc., 2004.
3. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services”, Pearson Education, 2004.
4. McGovern, et al., “Java Web Services Architecture”, Morgan Kaufmann Publishers, 2005.

MCSCS 105-4 **MULTIMEDIA SYSTEMS**

L	T	P	C
3	0	0	3

Module 1

Introduction and QoS: Introduction-QoS Requirements and Constraints-Concepts-Resources-Establishment Phase-Run-Time Phase-Management Architectures.

Module 2

Process management: Real Time Processing Requirements- Traditional real time scheduling-Real time scheduling system model - Soft real time scheduling-Scheduling Policies -Interprocess Communication-Memory Management.

File Systems: Traditional and Multimedia File Systems-Caching Policy-Batching-Piggy backing-Content insertion

Networks: Ethernet-Gigabit Ethernet-Token Ring-100VG AnyLAN-Fiber Distributed Data Interface (FDDI) - MAN-WAN.

Module 3

Communication: Transport Subsystem Requirements and Constraints-New Protocol Support of Network QOS-New protocols for Transport of Multimedia-Computer Supported Cooperative Work- Architecture-Joint use of Applications-Session Management-Internet Protocols and their Use in MBone Applications.

Module 4

Synchronization: Synchronization-Particularities of Synchronization in Multimedia systems-Synchronization Types-System Components involved in Synchronization- Synchronization Specification- Specification methods for Multimedia Synchronization-Case Studies-MHEG-MODE-ACME.

References:

1. Ralf Steinmetz and Klara Nahrstedt, “Multimedia Systems”, Springer, I Edition 2004.
2. Ralf Steinmetz and Klara Nahrstedt , “Media Coding and Content Processing”, Prentice hall, 2002.
3. Vaughan T, “Multimedia”, Tata McGraw Hill, 1999.

4. Mark J.B., Sandra K.M., “Multimedia Applications Development using DVI technology”, McGraw Hill, 1992.
5. Rao K. R., Zoran S. Bojkovic, Dragorad A. Milovacovic, “Multimedia Communication Systems: Techniques, Standards, and Networks”, Prentice Hall, 1st Edition, 2002.
6. Ze-Nian Li and Mark S. Drew, “Fundamentals of Multimedia”, Pearson, 2004.

MCS* 106-1 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

Module 1

Data Warehousing and Business Analysis**:** -Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools – Metadata – Reporting, Query tools and Applications – Online Analytical Processing (OLAP)

Module 2

Data Mining**:** Introduction - Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: -Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

Module 3

Classification and Prediction**:** -Issues Regarding Classification and Prediction –Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section

Module 4

Cluster Analysis and Applications and Trends in Data Mining**:** -Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis - Data Mining Applications – Trends in Data Mining

References:

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.

2. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
3. Soman K.P., Shyam Diwakar and Ajay V., “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
4. Gupta G. K., “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Pearson Education, 2007.

MCSCS 106-2 **EMBEDDED SYSTEMS**

L	T	P	C
3	0	0	3

Module 1

Introduction to Embedded Systems: Definition, Characteristics and Classification –Overview of Processors and hardware units in an embedded system – Software embedded into the system – Embedded System design process- Exemplary Embedded Systems.

Module 2

Devices and Buses for Devices Network: I/O Devices -Device I/O Types and Examples – Synchronous -Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices -UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports-Timer and Counting Devices -'12C', 'USB', 'CAN' and advanced I/O Serial high speed buses- ISA, PCI, PCI-X, cPCI and advanced buses.

Module 3

Embedded Programming: Programming in assembly language (ALP) vs. High Level Language -C Program Elements, Macros and functions -Use of Pointers -NULL Pointers -Use of Function Calls – Multiple function calls in a Cyclic Order in the Main Function Pointers – Function Queues and Interrupt Service Routines Queues Pointers – Concepts of EMBEDDED PROGRAMMING in C++ -Objected Oriented Programming – Embedded Programming in C++, 'C' Program compilers – Cross compiler – Optimization of memory codes.

Module 4

Real Time Operating Systems – Part -1 OS Services – Interrupt Routines Handling, Task scheduling models -Handling of task scheduling and latency and deadlines as performance metrics -Inter Process Communication And Synchronisation – Shared data problem – Use of Semaphore(s) – Priority Inversion Problem and Deadlock Situations – Inter Process Communications using Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual (Logical) Sockets – RPCs.

References:

1. David E. Simon, “An Embedded Software Primer”, Pearson Education Asia, First Indian Reprint 2000.
2. Wayne Wolf “Computers as Components: Principles of Embedded Computing System Design”, Morgan Kaufman Publishers, 2008.
3. Rajkamal, “Embedded Systems Architecture, Programming and Design”, TATA McGraw Hill, First reprint 2003.
4. Dr. Prasad K. V. K. K., “Embedded / Real-Time systems: Concepts, Design and Programming: The Ultimate Reference”, Dreamtech Press,2004

MCSCS 106-3 OBJECT ORIENTED SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Module 1

Process Models: Life cycle models ,Sequential Activity –Centered models Iterative Activity-Centered Models Entity –Centered Models Unified Process ,Iterative and Incremental Workflow ,Agile Processes .Modeling with Unified Modeling Language (UML). Requirement model, Analysis Model, Design model, Implementation model and Test Model.

Module 2

Analysis: Requirements Elicitation Activities, Managing Requirements .Analysis concepts, Analysis Activities from use cases to objects .Managing Analysis. Object Model (Domain Model) Analysis Dynamic Models – Non-functional requirements, Analysis Patterns.

Module 3

Design: System Design Decomposing the system System Design activities Design goals Managing System Design , Design Patterns ,Object Design Reusing pattern solutions Reuse activities Managing Reuse Documenting Reuse Assigning responsibilities. Specifying interfaces concepts and activities Managing object design Object Constraint Language

Module 4

Implementation, Deployment and Maintenance: Mapping Design (Models) to Code, mapping concepts, mapping activities, managing implementation. Testing concepts and activities, Managing Testing ,Configuration Management Project management.

References:

1. Bernd Bruegge, Alan H Dutoit, "Object-Oriented Software Engineering",2nd edition, Pearson Education, 2004.
2. Craig Larman, "Applying UML and Patterns", Pearson Education, 3rd edition, 2005.
3. Stephen Schach, "Software Engineering" , McGraw-Hill, 7th edition, 2007.
4. Ivar Jacobson, Grady Booch, James Rumbaugh, "The Unified Software Development Process", Pearson Education, 1999.
5. Alistair Cockburn, "Agile Software Development", Pearson Education, 2nd edition, 2007.

6. Grady Booch, James Rumbaugh , Ivar Jacobson, “Unified Modeling Language User Guide”, Publisher: Addison Wesley

MCSCS 106-4 **INFORMATION SECURITY**

L	T	P	C
3	0	0	3

Module 1

Introduction: History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

Module 2

Security Investigation: Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

Security Analysis: Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

Module 3

Logical Design: Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

Module 4

Physical Design: Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

References:

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2004.
2. Micki Krause, Harold F. Tipton, “Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2004.
3. Stuart Mc Clure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw-Hill, 2003.
4. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2005.

MCS* 107 **OPERATING SYSTEMS LAB**

L	T	P	C
0	0	3	2

List of Experiments:

1. Introduction to Linux-booting-login-simple commands

2. Wild card characters-grep-pipe-tee-command substitution-shell variables-subshells-filters-head,tail.cut,paste,sort,uniq,nl,join

3. Editors-Vi and Emacs

4. Communication commands-mail,talk,write,cron…

5. Process related commands-ps, kill, nohup, nice, time, archiving, tar-gzip-rpm

6. Shell Programming Commands -Shell variables, read, echo, command line arguments, &&, !!, if, while, case, for, until, test, set, shift, trap

7. Implement the following: Dining philosopher Problem, Producer Consumer problem, Binary Search Implementation using shell scripting, quick sort implementation using shell scripting, Message queue, Kernel compilation, System call implementation

8. System Administration-Booting, init, runlevels..

9. Setting up servers-DHCP, DNS, NFS, Apache, Samba

10. Programming in php environment-Installing and configuring apache and mysql for php demo
    Php syntax-variables-data types-functions-if..else, switch, for loop, while loop, do while, arrays, getting displaying manipulating form values
    My sql basics-connecting mysql with php-inserting &retriving table data using php

11. Introduction to PERL programming

MCSCS 108 **SEMINAR – I**

L	T	P	C
0	0	2	1

Each student shall present a seminar on any topic of interest related to the core / elective courses offered in the first semester of the M. Tech. Programme. He / she shall select the topic based on the References: from reputed International Journals, preferably IEEE journals. They should get the paper approved by the Programme Co-ordinator / Faculty member in charge of the seminar and shall present it in the class. Every student shall participate in the seminar. The students should undertake a detailed study on the topic and submit a report at the end of the semester. Marks will be awarded based on the topic, presentation, participation in the seminar and the report submitted.

MCS* 201 **MODERN COMPUTER NETWORKS**

L	T	P	C
3	1	0	4

Module 1

Physical Layer: Data Transmission- Analog and Digital Transmission, Transmission Impairments, Channel Capacity. Transmission Media- Wired Transmission, Wireless Transmission, Wireless Propagation, Line-of Sight Transmission, Signal Encoding Techniques, **Data link layer:** TCP/IP Protocol Architecture, Framing, Reliable Transmission, Ethernet (802.3) and Token Ring (802.5)

Module 2

Network Layer: Connecting Devices. ARP, RARP. IP Address – Sub netting / Super netting, Packet Forwarding with Classful / Classless Addressing, Datagram Fragmentation, Components in IP software, Private IP and NAT. ICMP. Routing Protocols -Distance Vector Routing-RIP, Link-State Routing-OSPF

Module 3

Transport Layer: UDP- Port Addressing, UDP datagram, UDP operation. TCP- TCP services and features, TCP segment, TCP connection, TCP state transitions, TCP module's algorithm, Flow and Error control, Congestion control. SCTP- SCTP services and features, Packet format, SCTP connection, State Transitions, Flow and Error control.

Module 4

Application Layer: DNS- Distribution of Name Space, Name Resolution, DNS messages, HTTP-Architecture, HTTP Transaction, DHCP - Address allocation, Packet format. SNMP- SMI, MIB, SNMP PDUs, Real Time Data Transfer- RTP, RTCP, Voice over IP-Session Initiation Protocol.

References:

1. William Stallings, "Data and Computer Communications" , Pearson Education.
2. Behrouz A Forouzan, "TCP/IP Protocol Suite", Tata McGraw-Hill.
3. Peterson and Davie, "Computer Networks A systems approach" , Elsevier.
4. Kurose and Ross, "Computer Networks A systems approach" , Pearson Education.
5. Behurouz A Forouzan, "Data Communications & Networking",4th edition, McGraw-Hill.

MCS* 202 **ADVANCED DATABASE SYSTEMS**

L	T	P	C
3	1	0	4

Module1

Parallel and Distributed Databases: Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Three Tier Client Server Architecture- Case Studies**.**

Module 2

Object and Object relational databases**:** Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL / Oracle – Case Studies.

Module 3

Enhanced Data models**:** Active Database Concepts and Triggers – Temporal Databases – Spatial Databases – Multimedia Databases – Deductive Databases – XML Databases: XML Data Model – DTD - XML Schema - XML Querying - Geographic Information Systems - Genome Data Management**.**

Module 4

Emerging Technologies: Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Database Systems - Transaction Execution in MDS- Mobile Transaction Models –Concurrency Control Mechanism- Transaction Commit Protocols- Mobile database Recovery: Log management in mobile database systems – Mobile database recovery schemes

References:

1. Elmasri R., Navathe S.B., “Fundamentals of Database Systems”, Pearson Education/Addison Wesley, Fifth Edition, 2007.

2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Pearson Education, Third Edition, 2007.
3. Henry F Korth, Abraham Silberschatz, Sudharshan S., “Database System Concepts”, McGraw Hill, Fifth Edition, 2006.
4. Date C.J, Kannan A. and Swamynathan S.,”An Introduction to Database Systems”, Pearson Education, Eighth Edition, 2006.
5. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw Hill, Third Edition, 2004.
6. Vijay Kumar, “Mobile Database Systems”, A John Wiley & Sons, Inc., Publication.

MCS* 203 COMPUTER SECURITY AND APPLIED CRYPTOGRAPHY

L	T	P	C
3	1	0	4

Module 1

Introduction to cryptography:- Concepts, approaches and principles of digital information security, types of attacks, model, cryptographic techniques – substitution and transposition techniques, steganography techniques.

Module 2

Introduction to Number Theory, Elliptic curve arithmetic.

Symmetric Key cryptography: Block cipher design principles and criteria, DES, IDEA, AES, RCS, Blowfish, Differential and linear cryptanalysis.

Asymmetric key cryptography: Principles of public key crypto systems, RSA algorithm, key management, Diffie-Hellman key exchange, elliptic curve cryptography

Module 3

Message Authentication and Hash functions: Authentication functions, message authentication codes, Hash functions and their security, MD5 , secure hash algorithms, HMAC.

Digital signatures and authentication protocols, Digital Signature standards, Kerberos, X.509 authentication service, PGP and S/MIME.

Module 4

Network Security: Introduction, IP Security-Overview, Architecture, AH, ESP, Combining Security Associations, Key Management

System Security- Intrusion Detection, Password Management, Viruses and related threats, Virus Counter measures, Firewalls-Design Principles, Trusted Systems,

Web Security:- Web Security consideration, Secure Socket Layer, Transport Layer Security,Secure Electronic Transaction.

References:

1. William Stallings, “Cryptography and network security- principles and practice”, Pearson Prentice Hall, 3 rd Edition.

2. Charlie Kaufman, Radia Perl man, Mike Speciner , “Network Security private communication in a practice”, Pearson Prentice Hall, 2nd Edition.
3. Atul Kahate , “Cryptography and network security”, TMGH.

MCS* 204 **COMPILER DESIGN**

L	T	P	C
3	1	0	4

Module 1

Principles Of Compiler – Compiler Structure – Properties of a Compiler – Optimization – Importance of Code optimization – Structure of Optimizing compilers – placement of optimizations in optimizing compilers – ICAN – Introduction and Overview – Symbol table structure – Local and Global Symbol table management. Intermediate representation – Issues – High level, medium level, low level intermediate languages – MIR, HIR, LIR – ICAN for Intermediate code

Module 2

Run-time support – Register usage – local stack frame – run-time stack – Code sharing – position–independent code – Symbolic and polymorphic language support - Optimization – Early optimization – Constant folding – scalar replacement of aggregates Simplification – value numbering – constant propagation – redundancy elimination – loop optimization. Procedure optimization – in-line expansion – leaf routine optimization and shrink wrapping

Module 3

Register allocation and assignment – graph coloring – control flow and low level optimizations - Inter-procedural analysis and optimization – call graph – data flow analysis – constant propagation – alias analysis – register allocation – global References: – Optimization for memory hierarchy. Code Scheduling – Instruction scheduling – Speculative scheduling – Software pipelining – trace scheduling – percolation scheduling

Module 4

Case Studies – Sun Compilers for SPARC – IBM XL Compilers – Alpha compilers – PA –RISC assembly language – COOL – (Classroom Object oriented language) - Compiler testing tools – SPIM

References:

1. Steven S Muchnik, “Advanced Compiler Design and Implementation”, Morgan Kaufmann publishers, Elsevier Science, India, Indian Reprint 2003.
2. Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Elsevier Science, India.
3. Sivarama P. Dandamudi, “Introduction to Assembly language programming: for Pentium and RISC processors”.
4. Allen Holub “Compiler Design in C”, Prentice Hall of India, 1990.
5. Alfred Aho, Ravi Sethi V., Jeffery Ullman D., “Compilers Principles, Techniques and Tools”, Addison Wesley, 1988.
6. Charles N. Fischer, Richard J. Leblanc, “Crafting a compiler with C”, Benjamin-Cummings Publishing Co., Inc. Redwood City, CA, USA.

MCS* 205-1 **NEURAL NETWORKS**

L	T	P	C
3	0	0	3

Module 1

Introduction to biological neuron, Artificial Neuron, Feedforward neural networks and supervised learning- Abstraction - Activation functions – mathematical preliminaries – Architecture – Properties and applications. Geometry of binary threshold neurons and their networks, Perceptrons and LMS.

Module 2

Back propagation network – BPN Learning algorithm - Examples. Considerations in implementing Back Propagation Algorithm. Structure growing algorithm, fast relatives of BPN- Applications of feed forward neural networks. Bayes' theorem- Implementing classification decisions with Bayes theorem.

Module 3

Recurrent neurodynamical systems: Dynamical systems – Stability-Linear and nonlinear dynamical systems-Lyapunov stability.

Associative Memory- Linear associative memory,Hopfield networks- Applications-Boltzmann machine.

BAM- BAM stability analysis- Continuous BAM- Adaptive BAM-Applications.

Module 4

ART: Noise saturation dilemma – solution. ART-Outstar- Instar-ART1- Applications. The new generation- pulsed neuron model- Integrate and fire neurons- conductance based models.

References:

1. Satish Kumar, "Neural Networks- A classroom Approach", The McGraw-Hill Companies.
2. James A. Anderson , "An introduction to Neural Networks" ,PHI.
3. Simon Haykin , "Neural Networks :A comprehensive foundation" , Pearson Education.

MCSCS 205-2 **GRID COMPUTING**

L	T	P	C
3	0	0	3

Module 1

Grid Computing: Introduction -Definition -Scope of grid computing. Grid computing model- Grid Protocols – Desktop grids: Characteristics – key elements – Role in enterprise computing infrastructure. Data grids: Avaki Data Grid – Data grid Architecture.

Module 2

Grid Computing Initiatives: Grid Computing Organizations and their roles – Grid Computing anatomy – Grid Computing road map. Grid Computing Applications: Merging the Grid services Architecture with the Web Services Architecture.

Module 3

Technologies: OGSA – Sample use cases – OGSA platform components – OGSI – OGSA Basic Services.

Managing Grid Environments: Managing grids – management reporting – monitoring – service level management – data catalogs and replica management.

Module 4

Grid Computing Tool Kits: Globus GT3 Toolkit – Architecture, Programming model, High level services – OGSI .Net middleware Solutions.

References:

1. Joshy Joseph & Craig Fellenstein, “Grid Computing”, PHI, PTR-2003.
2. Ahmar Abbas, “Grid Computing: A Practical Guide to technology and Applications”, Charles River media – 2003.
3. Ian Foster, Carl Kesselman, “The Grid2: Blueprint for a New Computing Infrastructure”. Morgan Kaufman, New Delhi, 2004.
4. Fran Bermn, Geoffrey Fox, Anthony Hey J.G., “Grid Computing: Making the Global Infrastructure a Reality”, Wiley, USA, 2003.
5. Maozhen Li, Mark Baker, “The Grid: Core Technologies”, John Wiley & Sons, 2005.
6. URLs: www.globus.org and glite.web.cern.ch (Unit 5).

MCSCS 205-3 **SOFTWARE TESTING**

L	T	P	C
3	0	0	3

Module 1

Testing Methodology: Introduction to Software Testing - Software Testing Terminology and Methodology -Verification and Validation. Dynamic Testing : Black Box Testing Techniques - Boundary Value Analysis - Equivalence Class Testing - State Table based Testing - Decision Table based Testing - Cause Effect Graphing based Testing - Error Guessing.

Module 2

Dynamic Testing: White Box Testing Techniques - Need of White box testing - Logic Coverage Criteria - Basis Path Testing - Graph Matrices - Loop Testing - Data Flow Testing - Mutation Testing. Static Testing: Inspections - Walkthroughs - Technical Reviews. Validation Activities. Regression Testing. Test Management: Test Organization - Structure of Testing Group - Test Planning - Detailed Test Design and Test Specifications.

Module 3

Testing Metrics for Monitoring and Controlling the Testing Process - Measurement Objectives - Attributes and Corresponding Metrics - Attributes - Estimation models - Architectural Design Metric - Information Flow Metrics - Cyclomatic Complexity measures - Function Point Metrics - Test Point Analysis - Some Testing Metrics. Efficient Test Suite Management. Software Quality Management: Software Quality - Quality Types - Broadening the concept of Quality - Quality Cost - Benefits of Investment on Quality - Quality Control - Quality Assurance - Quality management - QM and Project management - Quality factors - Methods of Quality Management - Software Quality Metrics.

Module 4

Testing Process Maturity Models - Need - Measurement and Improvement of a Test Process - Test Process Maturity Models. Test Automation: Automation and Testing Tools - Need of Automation - Categorization of Testing Tools - Selection of Testing Tools - Costs incurred in Testing Tools - Guidelines for Automated Testing - Overview of some commercial Testing Tools. Testing Object Oriented Software - Testing Web-based Systems.

References:

1. Naresh Chauhan, “Software Testing : Principles and Practices (with CD)”, Oxford University Press, 2010, pbk, 624 p, ISBN : 0-19-806184-7.
2. Ilene Burnstein, “Practical Software Testing”, Springer , 2003, ISBN NO: 81-8128-089-X.
3. Paul C. J., “Software testing: A craftsmen’s approach”, CRC Press, 2nd Ed, 2002.
4. Gopalswamy R., “Software testing”, Pearson, 2005.
5. Myers G. J., “The art of software testing”, Wiley Interscience New York, 2005.
6. Mall R., “Fundamentals of Software Engineering”, Prentice Hall of India, 2nd Ed, 2003.

MCSCS 205-4 COMPONENT BASED TECHNOLOGY

L	T	P	C
3	0	0	3

Module 1

Introduction: Components – objects – components and objects – modules – whitebox versus blackbox abstractions - interfaces – component weight – components and interfaces - callbacks and contracts – examples – forms of design level reuse – component architecture.

Module 2

CORBA Technologies: Object Request Broker – CORBA services – CORBA component model: portable object adapter – CCM components – CCM containers – Application objects – CORBA, UML, XML and MDA. Java Beans – Basic Java Services – Advanced Java services.

Module 3

COM and .NET Technologies: COM – COM object reuse- interfaces and polymorphism – Distributed COM – other COM services – compound documents and OLE – .NET components - assemblies – appdomains – contexts – reflection – remoting.

Module 4

Component Frameworks and Development: Frameworks for contextual composition: COM + contexts – EJB containers – CCM containers - CLR contexts and channels – tuple and object spaces - Black Box component framework – component-oriented programming – Tools: component design and implementation tools – testing tools - assembly tools.

References:

1. Clemens Szyperski, “Component Software: Beyond Object-Oriented Programming”, Addison Wesley, 2nd Edition 2002.
2. Andreas Vogel, Keith Duddy, “Java Programming with CORBA”, John Wiley & Sons 1998.
3. Corry, Mayfield, Cadman, “COM/DCOM Primer Plus”, Tec media, 1st Edition, 1999.

MCSCS 206-1 **MULTICORE ARCHITECTURE**

L	T	P	C
3	0	0	3

Module 1

Fundamentals of Superscalar Processor Design- Limitations of ILP, Super Scalar Processor Design, Multi Threading, Thread Level Parallelism – Introduction to Multicore Architecture – Multicore Vs MultiThreading.

Module 2

Symmetric shared memory architectures, distributed shared memory architectures, Issues related to multicore caches, Design of mutlicore core caches, levels of caches, cache optimization, Models of memory consistency, Virtual Memory.

Module 3

Cache coherence protocols (MSI, MESI, MOESI),scalable cache coherence, Snoop-based Multiprocessor Design -- Correctness requirements, design with single-level caches and an atomic bus, multilevel cache hierarchies, dealing with split-transaction bus, coherence for shared caches and virtually indexed caches, TLB coherence Overview of directory based approaches, design challenges of directory protocols, memory based directory protocols, cache based directory protocols, protocol design tradeoffs, synchronization.

Module 4

PowerPC architecture – RISC design, PowerPC ISA, PowerPC Memory Management Power 5 Multicore architecture design, Power 6 Architecture. Cell Broad band engine architecture, PPE (Power Processor Element), SPE (Synergistic processing element) Interconnection Network Design - Interconnection topologies, routing techniques, flow control mechanisms, router architecture, arbitration logic.

References:

1. Hennessey & Paterson, “Computer Architecture A Quantitative Approach”, Harcourt Asia, Morgan Kaufmann, 1999.
2. Kai Hwang, “Advanced Computer Architecture: Parallelism, Scalability and Programmability” McGraw-Hill, 1993.

3. Richard Y. Kain, “Advanced Computer Architecture: A System Design Approach”, PHI, 1999.
4. IBM Journals for Power 5, Power 6 and Cell Broadband engine architecture.
5. Rohit Chandra, Ramesh Menon, Leo Dagum, and David Kohr, “Parallel Programming in OpenMP”, Morgan Kaufmann, 2000.
6. Joseph JaJa, ” Introduction to Parallel Algorithms”, Addison-Wesley, 1992.

MCSCS 206-2 PARALLEL COMPUTATION AND APPLICATIONS

L	T	P	C
3	0	0	3

Module 1

Introduction to Parallel Processing-Evolution of Parallel architectures-Applications of architectural Parallelism- Architectural classification schemes- parallelism in algorithms- Parameters characterizing algorithm parallelism- speedup and efficiency of parallel algorithms- architectures- interconnection networks.

Module2

Structures and algorithms for Array Processors -SIMD array processors: SIMD computer organization- SIMD interconnection networks: static v/s dynamic, mesh connected ILLIAC network, MIMD Computers and Multiprocessors, Shared memory and message passing architecture – overview of shared memory multiprocessor programming- pipelined MIMD- multithreading.

Module 3

Multiprocessor Architecture -Functional structures, UMA and NUMA multiprocessors. Interconnection Networks: Time shared or common buses, Cross bar switch and multiport memories, Comparison of multiprocessor interconnection structure, multistage networks for multiprocessors.

Module 4

Data dependence and Parallelism: Discovering parallel operations in sequential code- variables with complex names-sample compiler techniques - data flow principles-data flow architectures- Implementing Synchronization and Data Sharing: The character of information conveyed by synchronization - synchronizing different kinds of cooperative computations-waiting mechanisms- mutual exclusion using atomic read and write.

References:

1. Harry F. Jordan and Gita Alaghband, “Fundamentals Of Parallel Processing”, Pearson Education, 2003.

2. Kaihwang and Faye A. Briggs, “Computer Architecture and Parallel Processing”, McGraw Hill Series.
3. Kaihwang, “Advanced Computer Architecture – Parallelism, Scalability, Programmability”.
4. Michael J. Quinn, “Parallel Computing – Theory and Practice”, McGraw Hill Publication.
5. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Benjamin/Cummings Publication.

MCSCS 206-3 **REAL TIME SYSTEMS**

L	T	P	C
3	0	0	3

Module 1

Introduction: Hard Versus Soft Real time Systems: Jobs and Processors –Real times, Deadlines and Timing constraints – Hard and Soft timing constraints – Hard Real time systems – Soft Real time systems – A reference model of Real time systems: Processors and resources – Temporal parameters of Real time workload – Periodic task model –Precedence constraints and data dependency – Other types of dependencies – Functional Parameters – Resource Parameters of Jobs and Parameters of resources – Scheduling hierarchy.

Module 2

Commonly used approaches to Real time scheduling: Clock driven approach – Weighted round robin approach – Priority Driven approach – Dynamic versus Static systems –Effective Release times and Deadlines – Optimality of EDF and LST – Challenges in validating timing constraints in Priority driven systems – Offline versus Online scheduling –Clock driven scheduling: Notations and assumptions – Static Timer driven scheduler –General structure of Cyclic schedules – Cyclic executives – Improving average response time of Aperiodic jobs – Scheduling Sporadic jobs .

Module 3

Priority driven scheduling of Periodic jobs: Static assumptions – Fixed priority versus Dynamic priority algorithms – Maximum schedulable utilization – Optimality of RM and DM algorithms – Schedulability test for Fixed priority tasks with Short response times – Schedulability Test for Fixed priority tasks with arbitrary response times – Sufficient Schedulability conditions for RM and DM algorithms.

Module 4

Scheduling Aperiodic and Sporadic Jobs in Priority Driven Systems: Assumptions and Approaches – Deferrable servers – Sporadic servers – Constant Utilization,. Resources and Resource Access Control: Assumptions on resources and their usage – Effects of resource contention and resource access control – Non preemptive Critical Sections – Basic Priority Inheritance Protocol – Basic Priority Ceiling Protocol - Stack Based Priority ceiling Protocol – Preemption Ceiling Protocol.

References:

1. Jane W.S. Liu, “Real-Time Systems”, Pearson Education, 2000, ISBN NO: 81–7758– 575-4.
2. Phillip A. Laplante, “Real-Time Systems Design and Analysis”, Prentice Hall of India, Second Edition, 2001, ISBN NO: 81-203-1684-3.
3. Krishna C. M., Kang G. Shin, “Real-Time Systems”, McGraw-Hill International Edition. ISBN: 0-07-114243-6.

MCSCS 206-4 INFORMATION STORAGE AND MANAGEMENT

L	T	P	C
3	0	0	3

Module 1

Introduction to Storage Technology: Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.

Module 2

Storage Systems Architecture: Hardware and software components of the host environment, Key protocols and concepts used by each component, Physical and logical components of a connectivity environment, Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Compare and contrast integrated and modular storage systems, High-level architecture and working of an intelligent storage system.

Module 3

Introduction to Networked Storage: Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, understand the need for long-term archiving solutions and describe how CAS fulfills the need, understand the appropriateness of the different networked storage options for different application environments.

Module 4

Information Availability and Monitoring and Managing Datacenter: List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, ,RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures , Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center.

Storage Virtualization: Virtualization technologies, block-level and file-level virtualization technologies and processes

References:

1. EMC Corporation, “Information Storage and Management”, Wiley, ISBN number: 04702942134.
2. Robert Spalding, “Storage Networks: The Complete Reference“, Tata McGraw Hill, Osborne, 2003.
3. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne, 2001.
4. Meeta Gupta, “Storage Area Network Fundamentals”, Pearson Education Limited, 2002.

MCS* 207 **NETWORK SIMULATION LAB**

L	T	P	C
0	0	3	2

List of Experiments:

1. A thorough study of packet capturing tool called WireShark.
2. Familiarizing Network Simulator – 2 (NS2) with suitable examples
3. Simulate a wired network consisting of TCP and UDP Traffic using NS2 and then calculate their respective throughput using AWK script.
4. Performance evaluation of different routing protocols in wired network environment using NS2
5. Performance evaluation of different queues and effect of queues and buffers in wired network environment using NS2
6. Compare the behavior of different variants of TCP (Tahoe, Reno, Vegas….) in wired network using NS2. Comparison can be done on the congestion window behavior by plotting graph.
7. Simulation of wireless Ad hoc networks using NS2
8. Simulate a wireless network consisting of TCP and UDP Traffic using NS2 and then calculate their respective throughput using AWK script.
9. Performance evaluation of different ad-hoc wireless routing protocols (DSDV, DSR, AODV …) using NS2
10. Create different Wired-cum-Wireless networks and MobileIP Simulations using NS2.

MCSCS 208 **SEMINAR – II**

L	T	P	C
0	0	2	1

Each student shall present a seminar on any topic of interest related to the core / elective courses offered in the second semester of the M. Tech. Programme. He / she shall select the topic based on the References: from reputed International Journals, preferably IEEE journals. They should get the paper approved by the Programme Co-ordinator / Faculty member in charge of the seminar and shall present it in the class. Every student shall participate in the seminar. The students should undertake a detailed study on the topic and submit a report at the end of the semester. Marks will be awarded based on the topic, presentation, participation in the seminar and the report submitted.

MCSCS 301 INDUSTRIAL TRAINING AND MINIPROJECT

L	T	P	C
0	0	20	10

The student shall undergo Industrial training of one month duration **and** a Mini Project of two month duration.. Industrial training should be carried out in an industry / company approved by the institution and under the guidance of a staff member in the concerned field. At the end of the training he / she has to submit a report on the work being carried out.

The mini project is designed to develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and computer science research. Students can take up any application level/system level project pertaining to a relevant domain. Projects can be chosen either from the list provided by the faculty or in the field of interest of the student. For external projects, .students should obtain prior permission after submitting the details of the guide and synopsis of the work. The project guide should have a minimum qualification of ME/M.Tech in Computer Science or related fields.

At the end of each phase, presentation and demonstration of the project should be conducted, which will be evaluated by a panel of examiners. A detailed project report duly approved by the guide in the prescribed format should be submitted for end semester assessment. Marks will be awarded based on the report and their performance during presentations and demonstrations. Publishing the work in Conference Proceedings/ Journals with National/ International status with the consent of the guide will carry an additional weightage in the review process

MCSCS 302 **MASTER'S THESIS PHASE - I**

L	T	P	C
0	0	10	5

In master's thesis Phase-I, the students are expected to select an emerging research area in Computer Science or related fields, After conducting a detailed literature survey, they should compare and analyze research work done and review recent developments in the area and prepare an initial design of the work to be carried out as Master's Thesis. It is expected that the students should refer National and International Journals and proceedings of National and International conferences while selecting a topic for their thesis. He/She should select a recent topic from a reputed International Journal, preferably IEEE/ACM. Emphasis should be given for introduction to the topic, literature survey, and scope of the proposed work along with some preliminary work carried out on the thesis topic.

Students should submit a copy of Phase-I thesis report covering the content discussed above and highlighting the features of work to be carried out in Phase-II of the thesis. Students should follow standard practice of thesis writing. Presenting the work, carried out by the students in a National/International Conference is encouraged.

The candidate should present the current status of the thesis work and the assessment will be made on the basis of the work and the presentation, by a panel of internal examiners in which one will be the internal guide. The examiners should give their suggestions in writing to the students so that it should be incorporated in the Phase–II of the thesis.

MCSCS 401 **MASTER'S THESIS**

L	T	P	C
0	0	30	15

In the fourth semester, the student has to continue the thesis work and after the successful completion of the work, he / she have to submit a detailed thesis report. The work carried out should lead to a publication in a National / International Conference. They should submit the paper before the evaluation of the thesis and specific weightage will be given to accepted papers in reputed conferences.

MCSCS 402 **MASTER'S COMPREHENSIVE VIVA**

A comprehensive viva-voce examination will be conducted at the end of the fourth semester by an internal examiner and external examiners appointed by the university to assess the candidate's overall knowledge in the respective field of specialization.