SCHEME OF STUDIES & EXAMINATION FOR

M. TECH.

COMPUTER SCIENCE & TECHNOLOGY

M.D.UNIVERSITY, ROHTAK (HARYANA)
SCHEME OF STUDIES & EXAMINATION FOR MASTER OF TECHNOLOGY COURSE IN
COMPUTER SCIENCE & TECHNOLOGY

SEMESTER-I

S.No	Course No.	Subject	Teaching Schedule			Examination Schedule (Marks)				Duration of Exam (Hours)
			L	**P**	**Total**	**Class work**	**Theory**	**Practical**	**Total**	
1	MTCST - 101	Theory of Computation	4	0	4	50	100	0	150	3
2	MTCST – 102	Object Oriented Systems	4	0	4	50	100	0	150	3
3	MTCST – 103	Data Structures and Algorithms	4	0	4	50	100	0	150	3
4	MTCST – 104	Advanced Database Management System	4	0	4	50	100	0	150	3
5	MTCST – 105	Software Engineering	4	0	4	50	100	0	150	3
6	MTCST – 106	DSA Lab	0	2	2	50	0	50	100	3
7	MTCST – 107	ADBMS Lab	0	2	2	50	0	50	100	3
		TOTAL	20	4	24	350	500	100	950	

NOTE:

1. The paper setter shall set each theory paper of 100 marks covering the entire syllabus and the same will be evaluated on marks.
2. The Sessionals of Theory/Practical Courses shall also be evaluated on the basis of marks.
3. The choice of students for any elective shall not be binding on the Deptt. to offer it.

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SEMESTER-II

S.No	Course No.	Subject	Teaching Schedule			Examination Schedule (Marks)				Duration of Exam (Hours)
			L	**P**	**Total**	**Class work**	**Theory**	**Practical**	**Total**	
1	MTCST – 201	Compiler Design	4	0	4	50	100	0	150	3
2	MTCST – 202	Distributed Operating System	4	0	4	50	100	0	150	3
3	MTCST – 203	Analysis & Design of Algorithms	4	0	4	50	100	0	150	3
4	MTCST	Elective -1	4	0	4	50	100	0	150	3
5	MTCST – 204	Operating System Lab	0	3	3	50	0	50	100	3
6	MTCST – 205	Compiler Design Lab	0	3	3	50	0	50	100	3
7	MTCST – 206	Seminar on Advanced Topics	0	2	2	50	0	0	50	3
		TOTAL	16	8	24	350	400	100	850	

NOTE:

1. The paper setter shall set each theory paper of 100 marks covering the entire syllabus and the same will be evaluated on marks.
2. The Sessionals of Theory/Practical Courses shall also be evaluated on the basis of marks.
3. The choice of students for any elective shall not be binding on the Deptt. to offer it.

Elective -1

MTCST – 207 Multimedia Technologies
MTCST – 208 Image Processing
MTCST – 209 Digital Signal Processing
MTCST – 210 Parallel Computation and Applications
MTCST – 211 Software Testing
MTCST – 212 Computer Networks & Data Communication

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SEMESTER-III

S.No	Course No.	Subject	Teaching Schedule			Examination Schedule (Marks)				Duration of Exam (3 hours)
			L	**P**	**Total**	**Class work**	**Theory**	**Practical**	**Total**	
1	MTCST - 301	Artificial Intelligence	4	0	4	50	100	0	150	3
2	MTCST	Elective -2	4	0	4	50	100	0	150	3
3	MTCST	Elective -3	4	0	4	50	100	0	150	3
4	MTCST – 302	AI Lab	0	3	3	50	0	50	100	3
5	MTCST – 303	Project	0	8	8	100	0	200	300	3
		TOTAL	12	11	23	300	300	250	850	

NOTE:

1. The paper setter shall set each theory paper of 100 marks covering the entire syllabus and the same will be evaluated on marks.
2. The Sessionals of Theory/Practical Courses shall also be evaluated on the basis of marks.
3. The choice of students for any elective shall not be binding on the Deptt. to offer it.

Elective -2

MTCST – 304 Advance Computer Architecture
MTCST – 305 Cellular and Mobile Communication
MTCST – 306 Digital Security
MTCST – 307 Object Oriented Software Engineering
MTCST – 308 Enterprise Resource Planning
MTCST – 309 Grid Computing
MTCST – 310 Natural Language Processing
MTCST – 311 Quantum Computing

Elective – 3

MTCST – 312 Mobile Computing
MTCST – 313 Artificial Neural Network
MTCST – 314 Data Mining
MTCST – 315 Bioinformatics
MTCST – 316 Real Time Operating System
MTCST – 317 Fuzzy Logic & Design
MTCST – 318 Cyber Crime Investigations & Cyber Forensics
MTCST – 319 Geographical Information System

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SEMESTER-IV

S.No	Course No.	Subject	Teaching Schedule			Examination Schedule (Marks)				Duration of Exam (3 Hours)
			L	**P**	**Total**	**Class work**	**Theory**	**Practical**	**Total**	
1	MTCST - 401	Dissertation	-	20	20	300	0	450	750	3

MTCST-101 THEORY OF COMPUTATION

L	T/P	C
4	0	4

1. Introduction: Mathematical notions and terminology of sets, sequences and tuples, functions and relations, graphs, strings and languages. Boolean logic properties and representation. Definition, Theorems and types of proofs, formal proofs, deductive, reduction to definition, proof by construction, contradiction, induction, counter-examples.

2. Regular Languages: Alphabets and languages, Finite Representation of Languages. Deterministic Finite Automata, Non- deterministic Finite Automata, Equivalence of Deterministic and Non-Finite Automata, Properties of the Languages Accepted by Finite Automata, Finite Automata and Regular Expressions.

3. Context free languages: Context-Free Grammar, Regular Languages and Context-Free Grammar, Pushdown Automata – Pushdown Automata and Context-Free Grammar, Properties of Context-Free Languages, Closure Properties, Periodicity Properties, Determinism and Parsing, Deterministic Pushdown Automata and Context – Free Languages, Top- down Parsing, Bottom – Up parsing.

4. Turing Machines: The Definition of Turing Machine, Computing with Turing Machines, variants of TMs, programming techniques for TMs, TMs and computers.

5. Decidability: Decidable languages, decidable problems concerning Context free languages. The halting problem – Diagonalization method, halting problem is undecidable.

6. Reducibility: Undecidable problems from language theory. Regular expressions, Turing machines, Reduction, A simple undecidable problem (PCP).

7. Computability: Primitive recursive functions, more examples, the recursion theorem.

Text Books:

1. Introduction to Automata Theory, Languages and Computation - J. E. Hoperoft, Rajeev Motawani and J.D. Ullman(Pearson Education Asia) 2nd Edition.
2. Theory of Computer Science (Automata, Languages and Computation), K.L. Mishra, PHI.
3. Introduction to Theory of Computation Michael Spicer (Thomson Brools Cole)

Reference Books:

1. Discrete Mathematical structures with applications to computer science - J. P. Thembloy and R. Manohar.
2. Theory of Computer Science – E. V. Krishnamoorthy

MTCST-102 OBJECT-ORIENTED SYSTEM

L	T/P	C
4	0	4

1. Introduction: Overview of object-oriented systems development, objects basics, object-oriented system development life cycle.

2. UML: Object-oriented methodologies, Unified modeling language

3. Analysis: Object-oriented analysis process: Identifying use cases, Object analysis: classification, Identifying object relationships, attributes and methods

4. Design: Object-oriented Design Process and Design Axioms Designing classes,
Access Layer: Object storage and object interoperability.
View Layer: Designing interface objects.

5. Soft ware Quality Assurance: Introduction, QA Tests, Testing strategies, Impact of Object orientation on Testing, Test cases, Test Plan, Continous Testing, Myer's Debugging Principles.

Text Book:

1. Ali Bahrami: Object-oriented systems Development, McGrawHill, 1999

Reference Books:

1. Craig Larman : Applying UML and Patterns, Pearson Education, 2002
2. Grady Booch: Object-oriented analysis and design, Addison – Wesley, 1994

MTCST-103 DATA STRUCTURES AND ALGORITHMS

L	T/P	C
4	0	4

1. Introduction: Overview of C++ classes, pointers, parameters passing, templates.

2. Fundamentals of algorithm analysis: Big 'O' notations, Time and space complexity of algorithms, Elementary data structures and their applications

3. Arrays: ordered lists, representation of arrays, sparse matrices, linked lists: singly and doubly linked lists, stacks, queues, multiples stacks and queues, Applications: polynomial arithmetic, infix, postfix and prefix arithmetic expression conversion and evaluations.

4. Lists, Stacks & Queues: Abstract Data Types, Representation & implementation of linked list, Doubly linked list, Circular linked lists, Stacks, array representation of stack. Applications of stacks. Queues, array representation of Queues, Circular queues, Deques, priority queues, Applications of Queues.

5. Trees: Introduction to trees, binary trees, representation and traversal of trees, operations on binary trees, types of binary trees, threaded binary trees, B Trees, AVL Trees, Application of trees.

6. Graphs: Representation, traversal, connected components, shortest path and transitive closure, topological sort, activity network, critical path, path enumeration. Dijkstra's Algorithm, Floyd Warshall's Algorithm, Minimum Spanning Tree Definitions.

7. Searching & Sorting: searching techniques, Hash function, Hash table, Internal sort: Radixsort, Insertion sort, Exchange sort, Selection sort, Quicksort, Mergesort, Heaport, External sort: K-way mergesort, balanced mergesort.

8. Files: Files, Queries and sequential organization; Cylinder surface indexing, Hashed Indexed, Tree Indexing, Sequential file organizational, random file organization, Hashed file organization, Inverted files, cellular partitions.

Text Books:

1. E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Booksource Pvt. Ltd, 1999.
2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss. Second edition, Pearson Edition. Asia.
3. Data Structures using C by A.M.Tenenbaum, Langsam, Moshe J. Augentem, PHI pub.

References Books:

1. Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
2. Y. Langsam et. al., "Data Structures using C and C++", PHI, 1999.
3. Theory & Problems of Data Structures by Jr. Symour Lipschetz, Schaum's outline, TMH

MTCST-104 ADVANCED DATABASE MANAGEMENT SYSTEMS

L	T/P	C
4	0	4

1. Relational Databases: Integrity Constraints revisited, Extended ER diagram, Relational Algebra, Structure of RDBMS, Normal forms.

2. Parallel and Distributed Databases: Distributed Data Storage – Fragmentation & Replication, Location and Fragment Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.

3. Objected Oriented and Object Relational Databases: Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases

4. Multimedia database system: multimedia database management system, image and text database techniques, Audio and Video Database Techniques Physical Storage and Retrieval. Data structure, Operation, indexing, segmentation.

5. WEB Database: Accessing Databases through WEB, WEB Servers, XML Databases, and Commercial Systems.

6. Data Mining & Data Warehousing: Knowledge Representation Using Rules, Association and Classification Rules, Sequential Patterns, Algorithms for Rule Discovery, Data Warehousing Architecture, Multidimensional Data Model, Update Propagation OLAP Queries.

Text Books:

1. R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998
1. Principals of distributed Database system (2nd edition) M. Tamer Ozsu. Patrick valduriez (Pearson)
2. Database system concepts Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006

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. W. Kim, "Modern Database Systems", 1995, ACM Press, Addision – Wesley,
4. Ullman, J. D., "Principals of database systems", Galgotia publications, 1999.

MTCST-105 SOFTWARE ENGINEERING

L	T/P	C
4	0	4

1. Introduction: Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models, Overview of Quality Standards like ISO 9001, SEI – CMM.

2. Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD & Use case approach, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

3. Software Project Planning: Size Estimation like lines of Code & Function Count, Cost Estimation Models, Static single & Multivariable Models, COCOMO, COCOMO-II, Putnam resource allocation model, Risk Management.

4. Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design.

5. Software Metrics: Software measurements: What & Why, Token Count, Halstead Software Science Measures, Design Metrics, Data Structure Metrics, Information Flow Metrics

6. Software Testing: Testing process, Design of test cases, functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Path Testing, Data flow and mutation testing, Unit Testing, Integration and System Testing, Debugging, Alpha & Beta Testing, Regression Testing, Testing Tools & Standards.

7. Software Reliability: Importance, Hardware Reliability & Software Reliability, Failure and Faults, Reliability Models, Basic Model, Logarithmic Poisson Model, Calender time Component.

8. Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

Text Books:

1. K. K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International, 2001.
2. R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001.

Reference Books:

1. R. Fairley, "Software Engineering Concepts", Tata McGraw Hill, 1997.
2. P. Jalote, "An Integrated approach to Software Engineering", Narosa, 1991.
3. Stephen R. Schach, "Classical & Object Oriented Software Engineering", IRWIN.
4. James Peter, W. Pedrycz, "Software Engineering", John Wiley & Sons., 1999
5. I. Sommerville, "Software Engineering", Addison. Wesley, 1999

MTCST 106

Data Structure & Algorithm Lab

L	T	P
0	0	2

Practical based on theory paper Data Structure & Algorithm.

MTCST 107

Advance Database Management System Lab

L	T	P
0	0	2

Practical based on theory paper Advance Database Management System.

MTCST-201 **COMPILER DESIGN**

L	T/P	C
4	0	4

1. Introduction: Compiler & translators, Structure of compiler, Lexical Analyzer, Syntax analyzer, Intermediate code generator. Optimization, code generation, Error handling, compiler writing tools, structures of high-level language, The Syntactic specification of programming Languages.

2. Lexical Analysis: Lexical Analyzer, approaches to design of Lexical Analyzer, regular expression, finite automata, language for specifying Lexical Analyzer, Implementation of a Lexical Analyzer.

3. Parsing Techniques: Parsers, Shift reduce parsing, operator – precedence parsing, Top-Down parsing, predicative parsing, LR parsers, Construction of SLR Parser, CLR Parser and LALR Parser.

4. Syntax Directed Translation: Syntax- directed translator schemes and implementation, intermediate code, postfix notation, three address coding, quadruple & triple, translation of assignment statements, Boolean expression, Conditional statements, Postfix translations, array reference, Procedure calls, case statements, record structures.

5. Code Optimization: Sources of Optimization, Loop Optimization, DAG representation, Global Data Flow Analysis.

6. Code Generation: Problems in code generation, Simple code generator, code generator from DAG's, Peephole optimization.

7. Brief description of Symbol tables, Error detection and recovery, Runtime storage administration.

Text Book:

1. Principles of compiler design by Alfred V.Aho, D. Ullman

Referece Books:

1. Compiler Design, Trembly and Sorauson, Tata Mcgraw Hill.
2. Systems programming by John. J. Donovan
3. Theory of Computer science by K.L.P. Mishra & N.Chandra Sekhran
4. Compiler Design in C – Allen I. Holub, PHI.

MTCST-202 DISTRIBUTED OPERATING SYSTEM

L	T/P	C
4	0	4

1. Distributed computing systems fundamentals: Introduction to Distributed computing systems, Models, Popularity. Distributed computing system, Design issues of Distributed operating system. Distributed computing environment, security.

2. Message Passing: Features of a good Message Passing System. Issues in IPC by Message Passing Synchronization, Bullring, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure handling, Group Communication.

3. Remote Procedure Calls: RPC Model, Implementing RPC Mechanism. Stub Generation. 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.

4. 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.

5. Resource Management: Features of global scheduling algorithm. Task assignment approach, Load-Balancing and Load approach.

6. Process Management: Introduction, Process Migration, Threads.

7. Distributed File Systems: Features of good DFS, File models, File Accessing models. File-Sharing Semantics, File-Caching schemes, File Replication, Fault Tolerance, Automatic Transactions, Design Principles, Case study: DCE Distributed File Service.

Text book:

1. Distributed Operating Systems concepts and design- .K. Sinha (PHI).
2. Modern Operating System-Singhal

Reference Books:

1. Distributed Systems concepts and design-G.Coulouris, J.Dollimore & T. Kindberg
2. Modern Operating System-A.S. Tanenbaum(PHI).

MTCST-203 ANALYSIS AND DESIGN OF ALGORITHMS

L	T/P	C
4	0	4

1. Introduction: Analyzing algorithms, Designing algorithms, asymptotic notation, Standard notations and common functions, the substitution method, the recursion tree method, the master method.

2. Sorting and Order statistics: Heaps- maintaining the heap property, building a heap, The heapsort algorithm, description of quick sort, performance of quicksort, Analysis of quicksort, Lower bounds for sorting-Counting sort, Radix sort, Bucket sort.

3. Dynamic Programming: Assembly-line scheduling, Matrix chain multiplication-elements of dynamic programming, longest common subsequence, optimal binary search trees.

4. Greedy algorithms: An activity selection problem, Elements of greedy strategy, Huffman codes, a task scheduling problem.

5. Graph algorithms: Representation of graphs, Breadth first search, Depth first search, Topological sort, strongly connected components, Growing a minimum spanning tree-Kruskal and Prims algorithms, Single source shortest paths in directed acyclic graphs-The Bellman-Ford Algorithm, Dijkstra's Algorithm. All pairs shortest paths and matrix multiplication- The Floyd-Warshall algorithm, Johnson's algorithm for sparse matrices.

6. NP-completeness: Polynomial time and its verification-NP-completeness-reducibility-proofs and NP-complete problems- The vertex cover problem, The travelling salesman's problem, The set cover problem-Randomization and linear programming, The subset-sum problem.

7. String Matching: the naïve string matching algorithm, the Rabin Karp algorithm, string matching with finite automata, the Knuth-Morris-Pratt algorithm.

Text Book:

1. Introduction to Algorithms, by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.

Reference Books:

1. The Design and Analysis of computer Algorithms, by Aho, Hopcroft & Ullman, Pearson Education.
2. Algorithm Design by Michel T. Goodrich & Roberto Tamassia, John Weily and Sons.
3. Fundamentals of sequential and parallel algorithms, by Kenneth A. Berman & Jerome L. Paul, Vikas Publishing House.

MTCST 204

Operating System Lab

L	T	P
0	0	3

Practical based on theory paper Operating System.

MTCST 205

Compiler Design Lab

L	T	P
0	0	3

Practical based on theory paper Compiler Design.

MTCST-206 SEMINAR ON ADVANCED TOPICS

L	T/P	C
	3	3

Purpose: To enable a student to be familiar with Communication skills.

Student is expected to learn

a. How to make a presentation
   - i. Verbal
   - ii. Non Verbal
   - iii. LCD based Power Point

b. How to write a report
   - i. Abstract
   - ii. Body
   - iii. Conclusions
   - iv. Executive Summary

c. Group Discussion
   - i. Share the work with a group
   - ii. Modularization of the work
   - iii. Shareware Development

d. Communication
   - i. Horizontal
   - ii. Vertical

- Students will be given a topic of importance and are expected

  a. To present the topic verbally in 30 minutes
  b. To present the topic as a report in 30 pages

MTCST-207 MULTIMEDIA TECHNOLOGY

L	T/P	C
4	0	4

1. Introduction: Concept of Multimedia, Media & data stream, main properties of multimedia system, Data stream characteristics &for continuous media Multimedia Applications, Hardware Software requirements, Storage Technologies: RAID, Optical Media.

2. Components of multimedia and file formats: Text, Basic sound concepts , MIDI , Speech ,Basic concept of Images, Graphics format ,Basic concepts of Video & animation, Conventional system,Computer based animation, Authoring Tools, Categories of Authoring Tools.

3. Compression Techniques: Lossless and Lossy compression, Run length coding, Statistical Coding, Transform Coding, JPEG, MPEG, Text compression using static Huffmann technique, Dynamic Huffmann Technique, Arithmetic Technique.

4. Animation: Introduction, Basic Terminology techniques, tweaning & morphing, Motion Graphics 2D & 3D animation.

5. Introduction to MAYA (Animating Tool): Fundamentals, Modeling: NURBS, Polygon, Organic
Animation: Key frame animation, reactive animation, path animation, Skelton animation etc., deformers.
Dynamics: soft bodies, Rigid bodies and its usages in the scene etc.,
Rendering: soft,Hard renering. IPR rendering, Line and box rendering etc.,
Special Effects: Shading & Texturing Surfaces, Lighting, Special effects.

Text Book:

1.David Hillman, "Multimedia Technology & Applications", Galgotia Publications, 2000

Reference Books:

1. Nigel Chapman & Jenny Chapman, "Digital Multimedia", Wiley Publications, 2000
2. D.P. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI, 2001
3. Maya manuals.

MTCST-208 IMAGE PROCESSING

L	T/P	C
4	0	4

1. **Fundamentals of Image Processing:** Image Acquisition, Image Model, Sampling, Quantization, Relationship between pixels, distance measures, connectivity, Image Geometry, Photographic film.
Histogram: Definition, decision of contrast basing on histogram, operations basing on histograms like image stretching, image sliding, Image classification. Definition and Algorithm of Histogram equalization.

2. Image Transforms: - A detail discussion on Fourier Transform, DFT, FFT, properties a brief discussion on WALSH Transform, WFT, HADAMARD Transform, and DCT.

3. Image Enhancement: (by SPATIAL Domain Methods) a Arithmetic and logical operations, pixel or point operations, size operations, b. Smoothing filters-Mean, Median, Mode filters – Comparative study c.. Edge enhancement filters – Directorial filters, Sobel, Laplacian, Robert, KIRSCH Homogeneity & DIFF Filters, prewitt filter, Contrast Based edge enhancement techniques. – Comparative study d. Low Pass filters, High Pass filters, sharpening filters. – Comparative Study e. Comparative study of all filters
f. Color image processing.

4. Image enhancement: (By FREQUENCY Domain Methods) Design of Low pass, High pass, EDGE Enhancement, smoothening filters in Frequency Domain. Butter worth filter, Homomorphic filters in Frequency Domain, Advantages of filters in frequency domain, comparative study of filters in frequency domain and spatial domain.

5. Image compression: Definition, A brief discussion on – Run length encoding, contour coding, Huffman code, compression due to change in domain, compression due to quantization Compression at the time of image transmission. Brief discussion on:- Image Compression standards.

6. Image Segmentation: Definition, characteristics of segmentation. Detection of Discontinuities, Thresholding Pixel based segmentation method.
Region based segmentation methods – segmentation by pixel aggregation, segmentation by sub region aggregation, histogram based segmentation, spilt and merge technique. Use of motion in segmentation (spatial domain technique only).

7. Morphology: Dilation, Erosion, Opening, closing, Hit-and-Miss transform, Boundary extraction, Region filling, connected components, thinning, Thickening, skeletons, Pruning Extensions to Gray – Scale Images
Application of Morphology in I.P

Text Book:

1.Digital Image Processing , by Rafael C. Gonzalez and Richard E. Woods Addision Wesley

Reference books:

1. Fundamentals of Electronic Image Processing by Arthyr –R – Weeks, Jr. (PHI)
2. Image processing, Analysis, and Machine vision by Milan Sonka vaclan Halavac Roger Boyle, Vikas Publishing House.

MTCST-209 DIGITAL SIGNAL PROCESSING

L	T/P	C
4	0	4

1. Introduction: Signals and signal Processing, characterization & classification of signals, typical Signal Processing operations, example of typical Signals, typical Signals Processing applications.

2. Time Domain Representation of Signals & Systems: Discrete Time Signals, Operations on Sequences, Linear shift-invariant systems, Stability and Causality, Linear constant coefficient difference equations, Frequency domain representation of discrete-time systems, symmetry properties of the Fourier transform, Sampling of continuous-time systems.

3. Transforms: Z-transforms, Inverse Z-transform, properties of Z-transform, & its applications in system analysis & design. Discrete Fourier Transform (DFT) & its properties, computation of the DFT of real sequences, Linear Convolution using the DFT.

4. Digital Filter Structure: Block Diagram representation, Signal Flow Graph Representation, Equivalent Structures, Basic FIR Digital Filter Structures: Direct forms, Transposed forms, Cascaded forms, Poly phase realization and Linear phase FIR structures. Basic IIR Filter Structures: Direct forms, Transposed forms, Cascaded realizations and Parallel realizations. All pass filters, Digital Sine-Cosine Generator.

5. Digital Filter Design: Design of IIR Digital filters from analog filters, Properties of FIR digital filters, Desgin of FIR filters using Windows, Computer aided design of FIR filters, Comparison of IIR and FIR digital filters.

6. Computation of Discrete Fourier Transform: Complexity of the DFT computation by direct method, Goertzel algorithm, Decimation –in-time FFT algorithms, Decimation-in frequency FFT algorithms.

Text Books:

1. Alan V. Oppenheim & Ronald W. Schafer, " Digital Signal Processing" PHI, 2002
2. Sanjit K. Mitra, " Digital Signal Processing: A computer based approach" TMH, Second Edition, 2003

Reference Books:

1. Chi-Tsong Chen, " Digital Signal Processing, Spectral Computation and Filter Design" Oxford University Press, 2001.
2. Monson H. Hayes, " Schaum's Outline of Digital Signal Processing", TMH.
3. Richard W. Hammming, "Digital Filters", Dover Pubns, 1998.
4. Lars Wanhammar, " DSP Integrated Circuits", Academic Press, First edition, 1999.
5. Simon S. Haykin, " Adaptive Filter Theory, " Prentice Hall, 3rd Edition.

MTCST-210 PARALLEL COMPUTATION AND APPLICATIONS

L	T/P	C
4	0	4

1. Introduction to Parallel Processing: Criteria for judging the architecture, Architectural classification schemes, Trends towards parallel processing, Parallelism in uni processor systems, Parallel Computer Structure, Applications of parallel processing Principles of Pipelining - Principles of Linear and non-linear pipelining, classification of pipeline processors, general pipelines and reservation tables, Interleaved memory organization .

2. Structures and algorithms for Array Processors: SIMD array processors: SIMD computer organization, Masking and data routing mechanisms, SIMD interconnection networks: static v/s dynamic, mesh connected ILLIAC network, Barrel Shifter network, Shuffle-exchange and omega network.

3. Multiprocessor Architecture: Functional structures, UMA & NUMA multiprocessors. Interconnection Networks: Time shared or common buses, Bus arbitration algorithm, Cross bar switch and multiport memories, Comparison of multiprocessor interconnection structure, multistage networks for multiprocessors, Algorithm Analysis – Mathematical background, What to analyze, Running time calculation, Logarithms in Running time

4. Algorithm design techniques: Greedy algorithms, Simple Scheduling algorithms, Multiprocessor case, Huffman code analysis, Bin packing algorithms, Back tracking algorithms, Turnpike reconstruction algorithm Parallel processing terminology - Speed up, scaled speed up and parallelizability.

5. Elementary parallel algorithms: Hypercube SIMD model, Shuffle-exchange SIMD model, 2-D mesh SIMD, UMA multiprocessor, Broadcast Matrix multiplication - Algorithms for Processor arrays, Algorithms for multiprocessors and multicomputers. Sorting - Lower bounds on parallel sorting, Odd-Even transposition sort.

Text Books:

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

MTCST-211 SOFTWARE TESTING

L	T/P	C
4	0	4

1. Introduction: What is software testing and why it is so hard?, Error, Fault, Failure, Incident, Test Cases, Testing Process, Limitations of Testing, No absolute proof of correctness, Overview of Graph Theory.

2. Reporting and analyzing bugs: Problem reports, Content and Characteristics of Problem Report, analysis and Tactics for analyzing a reproducible bug. Making a bug reproducible.

3. Problem Tracking System: Objective of Problem Tracking System, tasks of the system, Problem tracking overview, users of the tracking system, mechanics of the database.

4. Functional & Structural Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.
Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing.

5. Test Case Design: Characteristics of a good test, equivalence classes and boundary values, visible state transitions, Race conditions and other time dependencies, load testing. Error guessing, Function equivalence testing, Regression Testing, General issues in configuration testing, printer testing
Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis, Regression Testing, Slice based testing

6. Testing Activities: Unit Testing, Levels of Testing, Integration Testing, System Testing, Debugging, Domain Testing.

7. Object Oriented Testing: Issues in Object Oriented Testing, Class Testing, GUI Testing, Object Oriented Integration and System Testing.

Text Books:

1. William Perry, "Effective Methods for Software Testing", John Wiley & Sons, New York, 1995.
2. Cem Kaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York, 1993.
3. Boris Beizer, "Software Testing Techniques", Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
4. Louise Tamres, "Software Testing", Pearson Education Asia, 2002

Reference Books:

1. K.K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2005
2. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
3. Boris Beizer, "Black-Box Testing – Techniques for Functional Testing of Software and Systems", John Wiley & Sons Inc., New York, 1995.

MTCST-301 ARTIFICIAL INTELLIGENCE

L	T/P	C
4	0	4

1. Introduction: Data, information and knowledge. Model of an intelligent system, Models of knowledge representations: Representation and reasoning in logic. Semantic representations: semantic networks, frames; Frame/ script systems; Conceptual dependency and conceptual graphs, Ontologies.

2. Knowledge based systems: Software architecture of a knowledge-based system, Rule-based programming and production systems, Rule chaining and inference control, Inference: reasoning about knowledge, Temporal reasoning, Inference under uncertainty: Bayesian techniques, Fuzzy reasoning, Case-based reasoning.

3. Machine Learning:
Symbol-Based: Framework for Symbol – Based Learning, Version Space Search, ID3 Algorithm, Un-supervised learning, Reinforcement Learning.
Connectionist: Perceptron Learning, Backpropagation Learning, Competitive Learning, Hebbian Coincidence Learning, Attractor Networks.

4. Advanced Topics of AI Problem Solving:
Automated Reasoning: Weak Methods in Theorem Proving, GPS and Difference Table, Resolution for Theorem Proving, Automated reasoning with PROLOG.
Understanding Natural Language: Role of Knowledge, Symbolic Analysis, Syntax, ATN Parsers, Stochastic Tools for Language Analysis, Natural Language Applications.

Text Books:

1. "Artificial Intelligence – Structures and Strategies for Complex Problem Solving", George F. Luger, 4th Edition, Pearson Education, 2003.
2. "Artificial Intelligence", Knight, Tata McGraw Hill
3. "Artificial Intelligence 'a Modern Approach" Russell & Norvig, 2nd edition, Pearson Education, 2003.

MTCST 302

Artificial Intelligence Lab

L	T	P
0	0	3

Practical based on theory paper Artificial Intelligence Lab.

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MTCST 303

Project

L	T	P
0	0	8

MTCST-304 ADVANCED COMPUTER ARCHITECTURE

L	T/P	C
4	0	4

1. Parallel computer models: The state of computing, Classification of parallel computers, Multiprocessors and Multicomputers, Multivector and SIMD computers.

2. Program and network properties: Conditions of parallelism, Program partitioning and scheduling, Program flow mechanisms, System Interconnect Architectures.

3. Principles of Scalable Performance: Performance Metrics and Measures, Parallel processing applications, speedup performance laws, scalability analysis and approaches.

4. Processors and Memory Hierarchy: Advanced processor technology, Superscalar and Vector Processors, Vector processing principles, Memory hierarchy technology, virtual memory technology.

5. Pipelining & Superscalar Techniques: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Arithmetic Pipeline Design, Superscalar and Super pipeline design.

6. Parallel & Scalable architectures: Multiprocessor system Interconnects, Cache coherence and synchronization mechanisms, message passing mechanisms, latency hiding techniques, principles of multithreading, scalable and multithreaded architecture

Text Books:

1. Kai Hwang, “Advanced computer architecture”; TMH. 2000

Reference Books:

1. J.P.Hayes, “Computer Architecture and organization”; MGH. 1998
2. V.Rajaranam & C.S.R.Murthy, “Parallel computer”; PHI. 2002
3. Stalling W, “Computer Organisation & Architecture”, PHI. 2000
4. M.J Flynn, “Computer Architecture, Pipelined and Parallel Processor Design”; Narosa Publishing. 1998
5. Hwang and Briggs, “Computer Architecture and Parallel Processing”; MGH. 1999

MTCST-305 CELLULAR & MOBILE COMMUNICATION

L	T/P	C
4	0	4

1. Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system, overview of generations of cellular systems.

2. Elements of Cellular Radio Systems Design and interference: General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems, introduction to co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects.

3. Cell Coverage for Signal & antenna structures: General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model-characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation, Characteristics of basic antenna structures, antenna at cell site, mobile antennas.

4. Frequency Management & Channel Assignment: Hand Off & Dropped Calls, Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment. Why hand off, types of hand off and their characteristics, dropped call rates & their evaluation.

5. Modulation method and coding for error detection and correction: Introduction to Digital modulation techniques, modulation methods in cellular wireless systems, OFDM. Block coding, convolution coding and Turbo coding.

6. Multiple access techniques: FDMA, TDMA, CDMA, Time-division multiple access (TDMA), code division multiple access (CDMA), CDMA capacity, probability of bit error considerations, CDMA compared with TDMA

7. Spread spectrum Techniques: Direct sequence spread spectrum, Frequency Hopping Spread spectrum techniques.

Text Books:

1. C. Y. Lee and William, “Mobile Cellular Telecommunications”, 2nd Ed, McGraw Hill. 2001
2. Mischa Schwartz, “Mobile Wireless Communications”, Cambridge Univ. Press, UK, 2005.

Reference Books:

1. Mobile Communication Hand Book”, 2nd Edition, IEEE Press. 2002
2. Theodore S Rappaport, “Wireless Communication Principles and Practice”, 2nd Ed, Pearson Education. 2002
3. Lawrence Harte, “3G Wireless Demystified”, McGraw Hill Publications. 2000
4. Kaveh Pahlavan and Prashant Krishnamurthy, “Principles of Wireless Networks”, PHI.2000

MTCST-306 DIGITAL SECURITY

L	T/P	C
4	0	4

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

2. Symmetric Key cryptography: Algorithm types and modes block cipher design principals and criteria, DES, IDEA, AES, RCS, Blowfish, Differential and liner cryptography.

3. Asymmetric key cryptography: Principal of public key crypto systems RSA algorithm, key management, Diffi-Hellman key exchange elliptic curve arithmetic, elliptic curve cryptography, Zero knowledge proof systems.

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

5. Digital signature, authentication protocols and applications: Digital signature, authentication protocols, Digital signature standards, Kerberos, X.509 authentication service, PGP and S/MIME.

6. Web Security: Web Security consideration, secure socket layer, transport layer security, and secure electronic transaction, secured VPN.

7. Legal, Privacy and Ethical issues in digital security: Program and data Protection by patents, copyrights and trademarks, information and the law, computer crime, privacy, ethical issues in digital security and codes of professional ethics.

Text Books:

1. Cryptography and network security- principal and practice – William Stallings (3rd Edition, Person Prentice Hall) .
2. Network Security private communication in a practice – char tic Kaufman, Radio Perl man, Mike spicier (2nd Edition Pearson Print ice Hall)
3. Cryptography and network security – Atul Kahate (TMGH)

MTCST-307 OBJECT ORIENTED SOFTWARE ENGINEERING

L	T/P	C
4	0	4

1. Software & Software Engineering : Software engineering, The nature of software, and as branch of engineering profession, stakeholders in software engineering, software quality, software engineering projects.

2. Developing requirements: Domain analysis, software project's starting point, problem definition and scope, What is requirement?, type of requirements, gathering and analyzing of requirements, requirements document types, reviewing, managing change in requirements,

3. Modeling with classes: UML, essentials of UML class diagrams, associations and multiplicity, generalization, instance diagrams, Interaction diagrams, state diagrams, activity diagrams

4. Using design patterns: Pattern introduction, the abstraction-occurrence pattern, general hierarchical pattern, the play-role pattern, the singleton pattern, the observer pattern, the delegation pattern, the adaptor pattern, the façade pattern, the immutable pattern, the read-only interface pattern and the proxy pattern.

5. Focusing on users and their tasks: User-centred design, characteristics of users, developing use case models of systems, the basics of user interface design, usability principles, evaluation users interfaces

6. Architecturing and designing software: The process of design, principles leading to good design, techniques for making good design decisions, software architecture, writing a good design document.

7. Testing and inspecting to ensure high quality: Basic definitions of defect, error and failure, effective and efficient testing, defects in ordinary and numerical algorithms, defects in timing and coordination, defects in handling stress and unusual situations, documentation defects, writing formal test cases and test plans, strategies for testing large software, inspections, quality assurance in general

Text Book:

1. Object-Oriented Software Engineering Practical software development using UML and Java by Timothy C. Lethbridge & Robert Langaniere TMH.

MTCST-308 ENTERPRISE RESOURCE PLANNING

L	T/P	C
4	0	4

1. ERP: Enterprise Perspective: An Overview, Features of ERP, MIS Integration, ERP drivers, Trends in ERP, ERP in India.

2. ERP: System Perspective: Management Information System, Operations Support System, DSS, Transaction Processing System, Network Structure of ERP System, ERP Work flow, Process modeling for ERP Systems, Communication in ERP Systems, OLTP, (On Line Transaction Processing), OLAP (On Line Analytical Processing), Enterprise Integration Application Tools for ERP.

3. ERP: Resource Management Perspective: Business Modules in ERP Packages, Finance, Production, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution, Resource Management, Business Process Reengineering, Relationship between ERP & BPR, ERP Implementation Life Cycle, Implementation methodology, ERP Project Management & Monitoring.

4. ERP: Key Issues: ERP and E-Commerce, ERP Culture, ERP and CRM, ERP and SCM, ERP Selection Issues, ERP in Public Sector Enterprises, Pre and Post Implementation Issues, ERP Vendors, Key ERP Consultants in India, Future Directions in ERP.

Text Books:

1. Alexis, Leon (Ist Edition, 2000). ERP Demystified. Tata McGraw Hill.
2. Garg, V.K. and Venket, Krishna, N.K., (Ist edition, 1997). ERP Concepts and Practices, PHI Publications.
3. Sadagopan, S. (Ist Ed., 1999). ERP: A Managerial perspective. Tata McGraw Hill.

Reference Books:

1. Langenalter, A. Gary (1st Edition, 2000). Enterprise Resources Planning and Beyond. St. Lucie Press, USA.
2. Imhoff, C. Loftis Lisa & Geiger, G. Jonathan (Ist Edition, 2001). Building the Customer Centric Enterprise. John Wiley & Sons.
3. Shankar, Ravi & Jaiswal, S. (Ist Edition, 1999). Enterprise Resource Planning. Galgotia Publications.
4. Diwan, Parag & Sharma, Sunil (Ist Edition, 1999). Enterprise Resource Planning: Manager's Guide. Excel Books.

MTCST-309 **GRID COMPUTING**

L	P	C
4	0	4

1. Grid Computing: Introduction - Definition - Scope of grid computing

2. Grid Computing Initiatives: Grid Computing Organizations and their roles – Grid Computing analog – Grid Computing road map.

3. Grid Computing Applications: Merging the Grid sources – Architecture with the Web Devices Architecture.

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

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

Text Books:

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.

MTCST-310 NATURAL LANGUAGE PROCESSING

L	P	C
4	0	4

1. Introduction: Knowledge in speech and language processing - Ambiguity - Models and Algorithms - Language, Thought and Understanding. Regular Expressions and automata: Regular expressions - Finite-State automata. Morphology and Finite-State Transducers: Survey of English morphology - Finite-State Morphological parsing Combining FST lexicon and rules - Lexicon-Free FSTs: The porter stammer -Human morphological processing

2. Syntax: Word classes and part-of-speech tagging: English word classes - Tagsets for English - Part-of-speech tagging - Rule-based part-of-speech tagging - Stochastic partof-speech tagging - Transformation-based tagging - Other issues. Context-Free Grammars for English: Constituency - Context-Free rules and trees - Sentence-level constructions - The noun phrase - Coordination - Agreement - The verb phase and sub categorization - Auxiliaries - Spoken language syntax - Grammars equivalence and normal form - Finite-State and Context-Free grammars - Grammars and human processing. Parsing with Context-Free Grammars: Parsing as search - A Basic Top Down parser - Problems with the basic Top-Down parser - The early algorithm Finite- State parsing methods.

3. Advanced Features and Syntax. Features and Unification: Feature structures Unification of feature structures - Features structures in the grammar – Implementing unification - Parsing with unification constraints - Types and Inheritance. Lexicalized and Probabilistic Parsing: Probabilistic context-free grammar - problems with PCFGs Probabilistic lexicalized CFGs - Dependency Grammars - Human parsing.

4. Semantic Representing Meaning: Computational desiderata for representations Meaning structure of language - First order predicate calculus - Some linguistically relevant concepts - Related representational approaches - Alternative approaches to meaning. Semantic Analysis: Syntax-Driven semantic analysis - Attachments for a fragment of English - Integrating semantic analysis into the early parser - Idioms and compositionality - Robust semantic analysis. Lexical semantics: relational among lexemes and their senses - WordNet: A database of lexical relations - The Internal structure of words - Creativity and the lexicon.

Text Books:

1. Daniel Jurafsky & James H.Martin, " Speech and Language Processing", Pearson Education (Singapore) Pte. Ltd., 2002.
2. James Allen, "Natural Language Understanding", Pearson Education, 2003.
3. Gerald J. Kowalski and Mark.T. Maybury, "Information Storage and Retrieval systems", Kluwer academic Publishers, 2000.
4. Tomek Strzalkowski " Natural Language Information Retrieval ", Kluwer academic Publishers, 1999.
5. Christopher D.Manning and Hinrich Schutze, " Foundations of Statistical Natural Language Processing ", MIT Press, 1999.

MTCST-311 **QUANTUM COMPUTING**

L	P	C
4	0	4

1. Overview, Computers and the Strong Church–Turing Thesis, The Circuit Model of Computation, A Linear Algebra Formulation of the Circuit Model, Reversible Computation, A Preview of Quantum Physics, Quantum Physics and Computation

2. The Dirac Notation and Hilbert Spaces, Dual Vectors, Operators, The Spectral Theorem, Functions of Operators, Tensor Products, The Schmidt Decomposition Theorem, Some Comments on the Dirac Notation

3. The State of a Quantum System, Time-Evolution of a Closed System, Composite Systems,Measurement, Mixed States and General Quantum Operations, Mixed States, Partial Trace General Quantum Operations

4. The Quantum Circuit Model, Quantum Gates, Qubit Gates, Controlled-U Gates,Universal Sets of Quantum Gates, Efficiency of Approximating Unitary Transformations, Implementing Measurements with Quantum Circuits

5. Superdense Coding, Quantum Teleportation, an Application of Quantum Teleportation

6. Probabilistic Versus Quantum Algorithms, Phase Kick-Back, The Deutsch Algorithm, The Deutsch–Jozsa Algorithm, Simon's Algorithm

Text Books:

1. Quantum Computing without Magic by Zdzis_law Meglicki
2. Quantum Computing Explained by DAVID McMAHON
3. Quantum Computer Science by Marco Lanzagorta, Jeffrey Uhlmann
4. An Introduction to Quantum Computing by Phillip Kaye, Raymond Laflamme, Michele Mosca

MTCST-312 MOBILE COMPUTING

L	T/P	C
4	0	4

1 Introduction: Wireless communication, Wireless data technologies, Frequencies for radio signals, antennas and signal propagation, need and types of multiplexing techniques, modulation types, use of spread spectrum, cellular systems.

2. Medium Access Control: Need for MAC algorithm, medium access methods and comparison of these methods.

3. Digital mobile Phone Systems: GSM: mobile services, system architecture, radio interference, protocols, localization and calling, hand over, security, new data services, other digital cellular networks, comparison with GSM.

4. Wireless LAN: Introduction, advantages and design goals for wireless LAN, Infrastructure, ad-hoc networks, IEEE 802.11: system and protocol architecture, physical layer, HIPERLAN protocol architecture and physical layer and MAC, Blue tooth physical and MAC layer. Wireless ad-hoc networks.

5. Protocols for mobile computing: Mobile network layer, mobile IP, Snooping TCP, Mobile TCP, Fast and selective retransmission and recovery, Transaction oriented TCP.

6. Wireless Application Protocol: WAP architecture wireless datagram protocol, transport layer security, WML, script.

7. Palm OS: - Architecture, features of kernel, memory, system managers, Symbian OS: Architecture, hardware interface, memory, management, Window CE: features and architecture.

Text Books:

1. Mobile Communications – Jachen Schiller (Addison- Wesley)
2. Mobile Computing – Asoke K Talukder, Roopa R Yavgal, (TMH Publishing)

MTCST-313 ARTIFICIAL NEURAL NETWORKS

L	T/P	C
4	0	4

1. Introduction: Inspiration from Neuroscience, History, Issues.

2. Hopfield model: Associative memory problem, model, stochastic networks capacity of stochastic n/w.

3. Optimization problems: Weighed matching problem, Traveling salesman problem, Graph bipartioning, optimization problems in image processing.

4. Simple perceptions: feed forward n/w, Threshold units, linear units, nonlinear units stochastic units, capacity of simple perception.

5. Multi-layer n/w: Back propagation, examples and applications performance of multilayer feed forward n/w Kohoanen self organizing n/w cognition & neocognutron.

6. Recurrent n/w: Boltzmann n/w, Recurrent Back propagation, Learning time sequence, Reinforcement learning.

7. Learning: Supervised, Unsupervised (Hebbian competitive), adaptive resonance theory, Traveling salesman problem.

Applications of artificial Neural Network.

Text Books:

1. Introduction to the theory of neural Computation-Hertz Keogh, Palmer
2. Artificial Neural Networks- B. Yegnanarayana (PHI)
3. Genetic Algorithms-David E. Goldberg (Addison Wesley)

MTCST-314 **DATA MINING**

L	T/P	C
4	0	4

1. Introduction: Introduction to Data Warehousing and data mining, basic elements of data warehousing, Data warehousing vs. OLAP.

2. Data model development for Data Warehousing: business model, selection of the data of interest, creation and maintaining keys, modeling transaction, data warehousing optimization, Data warehousing methodologies, type and comparisons.

3. Data Mining: Data mining techniques, data mining algorithms, classification, Decision- Tree based Classifiers clustering, association Association-Rule Mining Information Extraction using Neural Networks, Knowledge discovery, KDD environment.

4. Visualization: data generalization and summarization-based characterization, Analytical characterization: analysis of attribute relevance, mining class Comparison, Discriminating between classes, mining descriptive statistical measures in large database.

5. Data mining primitives, languages & system architectures: data mining primitives, Query language, designing GUI based on a data mining query language, architectures of data mining systems.

6. Application and trends in data mining: Applications, systems products and research prototypes, multimedia data mining, indexing of multimedia material, compression, space modeling.

7. Advanced topics: Web mining: web content mining, web structure mining, web usage mining, spatial mining, temporal mining.

Text books:

1. Paulraj ponniah, “Web warehousing fundamentals” – John Wiley.
2. M. H. Dunham, “Data mining introductory and advanced topics” – Pearson education
3. Han, Kamber, “Data mining concepts and techniques”, Morgan Kaufmann
4. Imhoff, Galemmo, Geiger, “Mastering data warehouse design”, Wiley dreamtech

MTCST-315 BIOINFORMATICS

L	P	C
4	0	4

1. Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition an prediction, Folding problem, Sequence Analysis, Homology and Analogy.

2. Protein Information Resources Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.

3. Genome Information Resources DNA sequence databases, specialized genomic resources.

4. DNA Sequence analysis Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases.

5. Pair wise alignment techniques Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dotplot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

6. Multiple sequence alignment Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching.

7. Secondary database searching Importance and need of secondary database searches, secondary database structure and building a sequence search protocol.

8. Analysis packages Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

Text Books:

1. Introduction to Bioinformatics, by T K Attwood & D J Parry-Smith Addison Wesley Longman
2. Bioinformatics- A Beginner's Guide by Jean-Michel Claveriw, Cerdric Notredame, WILEY dreamlech India Pvt. Ltd

Reference Books:

1. Introduction to Bioinformatics by M.Lesk OXFORD publishers (Indian Edition)

MTCST-316 REAL TIME OPERATING SYSTEMS

L	T/P	C
4	0	4

1. Basic Real Time Concepts: Terminology, Real time design issues, Example Real-time systems, Brief history**,** Real time Applications, multiprocessing architecture, Language issues: Language features, commonly used programming languages, Software life cycle: Phases of the software life cycle, non temporal transition in the software life cycle, spiral model.

2. Real time specification and design techniques: Natural languages , Mathematical specification , flow chart, structure chart, pseudo code, programming designing languages, finite state automata , data flow diagrams, Petri nets, warnier-orr notations, state charts, Sanity in using graphical techniques.

3. Real time kernels: Polled loop system, phase state driven code, co routine interrupt driven systems, foreground/background systems, full feature real time operating system

4. **Inter-Task Communicating and Synchronization:** Buffering Data, Mailboxes, Critical Regions, Semaphores, Event flags and signals, Deadlock.

5. Real time Memory Management: Process Stack Management, Dynamic Allocation, Static Schemes.

6. System performance Analysis and optimization: Response Time calculation, Interrupt Latency, Time- Loading and its Measurement, Scheduling is NPComplete, Reducing Response Times and Time-loading, Analysis of memory Requirements, Reducing Memory loading I/O performance.

7. Reliability, Testing and Fault tolerance: Faults, Failures, Bugs and effects, Reliability, testing fault tolerance.

8. Hardware, Software Integration: Goals of real time system integration tools, Methodology, The software Heisenberg Uncertainty Principle.

Text Book:

1. Real Time Systems Design and Analysis : An Engineer's Handbook Phillp A. Laplante, 2nd Edition, PHI

Reference Books:

1. Real Time system Design – Levi Shem Tov and Ashok K. Agrawala (TMH)
2. Proceedings of IEEE Special Issue on Real Time Systems (Jan 1994)
3. Real Time Systems and their Programming Language Burns, Alan and Andy Welling (New York, Addison Wesley)
4. The design of Real time Applications: M. Blackman (New York John Wiley & Sons).
5. Real time systems: C.M. Krishna, K.G. Shin (TMGh)

MTCST-317 FUZZY LOGIC & DESIGN

L	T/P	C
4	0	4

1. Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, α-cuts, Properties of α-cuts, Decomposition Theorems, Extension Principle.

2. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

3. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

4. Fuzzy Relations: Crisp & Fuzzy Relations, Projections & Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on single set, Equivalence, Compatibility & Ordering Relations, Morphisms, Fuzzy Relation Equations.

5. Possibility Theory: Fuzzy Measures, Evidence & Possibility Theory, Possibility versus Probability Theory.

6. Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges, Applications of Fuzzy Logic

7. Uncertainty based Information: Information & Uncertainty, Nonspecificity of Fuzzy & Crisp sets, Fuzziness of Fuzzy Sets.

Text Book:

1. G.J.Klir, Yuan,"Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.

Reference Books:

1. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
2. Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
3. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.

MTCST-318 CYBERCRIME INVESTIGATIONS AND CYBER FORENSICS

L	P	C
4	0	4

1. Introduction : Review of TCP/IP and TCP, IP Header analysis, Introduction to Cyber World, Cyber attacks and cyber security, Information warfare and cyber terrorism, Types of cyber attacks, Cyber Crime and Digital Fraud, Overview of Types of computer forensics i.e. Media Forensics, Network forensics (internet forensics), Machine forensic, Email forensic (e-mail tracing and investigations)

2. Live Data collection and investigating windows environment: windows Registry analysis, Gathering Tools to create a response toolkit (Built in tools like netstat, cmd.exe, nbtstat, arp, md5sum, regdmp etc and tools available as freeware like Fport, Pslist etc), Obtaining volatile Data (tools like coffee, Helix can be used) Computer forensics in windows environment, Log analysis and event viewer, File auditing, identifying rogue machines, hidden files and unauthorized access points

3. Live Data collection and investigating Unix/Linux environment: /Proc file system overview, Gathering Tools to create a response toolkit (Built in tools like losetup, Vnode, netstat, df, md5sum, strace etc and tools available as freeware like Encase, Carbonite etc). Handling Investigations in Unix/Linux Environment: Log Analysis (Network, host, user logging details), Recording incident time/date stamps, Identifying rogue processes, unauthorized access points, unauthorized user/group accounts,

4. Forensic tools and report generation: Recovery of Deleted files in windows and Unix, Analyzing network traffic, sniffers, Ethical Hacking, Hardware forensic tools like Port scanning and vulnerability assessment tools like Nmap, Netscan etc. Password recovery (tools like John the ripper, L0phtcrack, and THC-Hydra), Mobile forensic tools and analysis of called data record Template for computer forensic reports

Text Books:

1. Incident Response & Computer Forensics. Mandia, k, Prosise, c, Pepe, m. 2nd edition. Tata-McGraw Hill, 2003.
2. Guide to Computer Forensics and Investigations, 2nd edition, Bill Nelson, Amelia Phillips, Frank Enfinger, and Chris Steuart, Thomson Learning

References Books:

1. Digital Evidence and Computer Crime, 2nd Edition , Eoghan Casey , academic Press File System Forensic Analysis by Brian Carrier , addition Wesley
2. Windows Forensic Analysis DVD Toolkit (Book with DVD-ROM), Harlan Carvey, syngress Publication
3 EnCE: The Official EnCase Certified Examiner Study Guide, 2nd Edition , Steve Bunting, sybex Publication

MTCST-319 GEOGRAPHICAL INFORMATION SYSTEMS

L	T/P	C
4	0	4

1. Introduction: Definition of GIS and Related Terminology-Evolution of GIS-Components of GIS-Approaches to study of GIS

2. Maps and GIS: Introduction-Map Scale- Classes of maps-The mapping Process-Plane coordinate systems and Transformations- Geographic Coordinate System of Earth- Map Projection- Establishing a spatial framework for mapping Locations on Earth-Georeferencing-Acquisition of Spatial Data for the terrain- Topographic Mapping-Attribute Data for Thematic Mapping

3. Digital Representation of Geographic Data: Introduction-Technical Issues Pertaining to Digital Representation of Geographic Data-Database creation and management-Raster Geographic and Vector data representation-Object oriented Geographic Data representation-Relationship between Data representation and Data Analysis in GIS.

4. Data Quality and Data Standards: Introduction-Concepts and Definitions of Data Quality-Components of Geographic Data Quality-Assessment of Data Quality- Managing Spatial Data Errors-Geographic Data Standards-Geographic Data Standards And GIS Development.

5. Raster and Vector-Based GIS Data Processing: Introduction-Acquiring and Handling Raster Data Processing Cartographic Modeling-Characteristics of Vector-Based GIS Data Processing Vector Data Input Functions Nontopological GIS Analysis Functions Feature-Based Topological Functions Layer-Based Topological Functions Vector-Based Output Functions Application Programming.

6. Visualization of Geographic Information and Generation: Introduction-Cartography in the Context of GIS-Human-Computer Interaction and GIS- Visualization of Geographic Information Principles of Cartographic Design in GIS-Generation of Information Products

7. Remote Sensing and GIS Integration: Introduction-Principles of Electromagnetic Remote Sensing System Classifications-Imaging Characteristics of Remote Sensing Systems-Extraction of Metric Information from Remotely Sensed Images-Extraction of Thematic Information from Remotely Sensed Images- Integration of Remote Sensing and GIS

8. GIS Implementation and Project Management: Introduction-Software Engineering as Applied to GIS-GIS Project Planning-Systems Analysis and User Requirements-Geographic Database Design Methodology-GIS Application Software Design Methodology-Systems Implementation and Technology Rollout-Systems Maintenance and Technical Support

Text Book:

1. Concepts and Techniques of Geographic Information Systems, by C. P. Lo & Albert K. W. Yeung, Prentice Hall of India Ltd

Reference Books:

1. An Introduction to Geographical Information Systems, by Ian Heywood, Sarah Cornelium & Steve Carver, Pearson Education

2. Introduction to Geographic Information Systems, by Kang-rsung Chang, Tata McGraw Hill Publishing Company Limited

MTCST-401 **DISSERTATION**

L	T/P	C
	20	20

The student will submit a synopsis at the beginning of the semester for the approval from the project committee in a specified format. Synopsis must be submitted within two weeks. The first defense, for the dissertation work, should be held with in two months time. Dissertation Report must be submitted in a specified format to the project committee for evaluation purpose at the end of semester.