CURRICULUM AND SYLLABUS OF M.TECH (CS) PROGRAMME

1. Programme Title:

Master of Technology (M.Tech) in Computer Science.

2. Duration and Mode:

Duration of programme for a student shall be two (2) years with four consecutive semesters after admission. The mode of the programme is Regular (semester system).

3. Objective:

The objective of this programme is to train the manpower required

a. to meet the industry needs of the country,
b. to pursue research in specialized areas, and
c. to meet the growing needs of engineering colleges for trained faculty in Computer Science.

4. Eligibility Criteria:

A candidate will be eligible for admission in to M. Tech. (Computer Science) program if he/she has obtained the Bachelor of Technology degree in Computer Science/Information Technology/Electronics & Communication Engineering or Master of Computer Application or Master of Science in Computer Science/Information Sciences/Electronics degree from recognized University with not less than 55% marks in the aggregate or its equivalent CGPA. The knowledge of Urdu for the candidate is essential.

5. Intake:

The number of seats for the program is eighteen (18).

6. Admission:

a. The admission to the M. Tech programme is based on the rank secured by the candidate in a written test conducted by the University. Minimum qualifying marks shall be 30% in Entrance Test. The written test will be of 100 marks.

b. GATE qualified candidates are exempted from the entrance exam.

c. The 60% seats are reserved for candidates qualified in entrance exam and 40% seats are reserved for GATE qualified candidates. For GATE qualified candidates the preference will be given according to the rank in GATE exam. However if suitable number of GATE qualified candidates have not applied, the said seats may be filled through the entrance qualified candidates and vice-versa.

7. Syllabus: Each theory or lab courses shall have prescribed syllabus approved by BOS from time to time, as per following prescriptions:

a. **Theory Courses:** Five (5) units largely based on ONE standard textbook and two Reference Books prescribed by the concerned teacher.

b. **Lab Courses:** At least TEN (10) individual generic assignments and ONE Mini-Project, to be prescribed by the concerned teacher and approved by HoD.

8. Evaluation of Dissertation:

Every candidate shall be required to submit Dissertation as per the following details:-

i. **A Departmental Research Committee (DRC)** shall be constituted with Head of the Department as chair person and at-least two other faculty members.

ii. **Registration of Dissertation:** A candidate is permitted to register for the Dissertation after attaining the CGPA of 5.0 in first year courses (theory and practical subjects).

iii. After satisfying clause 8.(ii), a candidate has to submit, in consultation with his Dissertation supervisor, the title, objective and plan of action of his project work to the DRC for its approval. Only after obtaining the approval of DRC the student can initiate the Dissertation.

iv. A candidate shall submit status report (in a spiral binding) in two stages at least with a gap of 3 months between them.

v. The work on the dissertation shall be initiated in the beginning of the second year and the duration of the dissertation is for two semesters. A candidate is permitted to submit thesis only after successful completion of theory and practical courses with the approval of DRC not earlier than 40 weeks from the date of registration of the dissertation. For the approval of DRC the candidate shall submit the draft copy of thesis to the Head of the Department and shall make an oral presentation before the DRC and Supervisor.

vi. Three copies of the thesis certified by the supervisor shall be submitted to the Department after approval of the DRC.

vii. The thesis shall be evaluated by one examiner selected by the Dean. For this, Head of the Department shall submit a panel of 3 examiners, who are eminent in that field with the help of the concerned guide from the government institutes/universities.

viii. If the report of the examiner is not favorable, the candidate shall revise and resubmit the thesis, in the time frame of two months. If the report of the examiner is unfavorable again, the thesis shall be extended to six months.

ix. If the report of the examiner is favorable, Head of the Department shall make arrangement for the conduct of viva-voce examination. Viva-voce examination shall be conducted in front of the supervisor, DRC and the external examiner. After careful assessment the examiner shall report candidates work as:

1. Excellent
2. Good
3. Satisfactory
4. Unsatisfactory

x. If the report of the viva-voce is unsatisfactory, the candidate will retake the viva-voce examination within two months.

Course No.	Course Title	Contact periods per week			Credits	Internal Marks	External Marks	Total Marks
		Lecture L	Tutorial T	Practical P				
	Semester - 1							
MT111	Network and Computer Security	3	1	0	4	30	70	100
MT112	Advanced Computer Architecture	3	1	0	4	30	70	100
MT113	Neural Networks	3	1	0	4	30	70	100
MT114	Distributed Databases	3	1	0	4	30	70	100
	Elective-I	3	1	0	4	30	70	100
MTL11	Distributed Databases Lab	0	0	4	2	50	50	100
MTL12	Seminar	0	0	4	2	50	50	100
	Total	15	5	8	24	250	450	700
	Semester - 2							
MT121	Advanced Operating Systems	3	1	0	4	30	70	100
MT122	Data Structure and Algorithm Design	3	1	0	4	30	70	100
MT123	Distributed Systems	3	1	0	4	30	70	100
	Elective-II	3	1	0	4	30	70	100
	Elective-III	3	1	0	4	30	70	100
MTL21	Data Structure and Algorithm Design Lab	0	0	4	2	50	50	100
MTL22	Comprehensive Viva	-	-	-	2	50	50	100
	Total	15	5	4	24	250	450	700
	Semester - 3							
MTR31	Dissertation Part - I	-	-	-	12	200	400	600
	Total	-	-	-	12	200	400	600
	Semester - 4							
MTR41	Dissertation Part - II	-	-	-	20	200	400	600
	Total	-	-	-	20	200	400	600
	Grand Total				80	900	1700	2600

List of electives

Course No.	Course Title	Contact periods per week			Credits
		Lecture L	Tutorial T	Practical P	
	Elective-I				
MTE11	Parallel Algorithm	3	1	0	4
MTE12	Pattern Recognition	3	1	0	4
MTE13	Cluster and Grid Computing	3	1	0	4
MTE14	Wireless & Mobile Communication	3	1	0	4
MTE15	Machine Learning	3	1	0	4
MTE16	Fuzzy Systems	3	1	0	4
	Elective-II				
MTE21	Real Time System	3	1	0	4
MTE22	Software Metrics	3	1	0	4
MTE23	Software Quality Engineering	3	1	0	4
MTE24	Wireless Mobile Network	3	1	0	4
MTE25	Natural Language Processing	3	1	0	4
MTE26	Applied Cryptography	3	1	0	4
	Elective-III				
MTE31	Human Computer Interaction	3	1	0	4
MTE32	Bioinformatics	3	1	0	4
MTE33	Information Security and Cyber Laws	3	1	0	4
MTE34	Advanced Networks	3	1	0	4

MT111: NETWORK AND COMPUTER SECURITY **L T P C**
3 1 0 4

UNIT 1

Introduction: History and Overview of Cryptography, Historical Ciphers and Their Cryptanalysis, Definition of Perfect Secrecy, Shannon's Theorem, Basic Principles of Modern Cryptography Private Key Cryptography: Private Key Encryption, Computational Approach to Cryptography, Pseudo Randomness, Constructing Secure Encryption Schemes, Chosen Plaintext Attacks, CPA Secure Encryption Schemes, Chosen Cipher Text Attacks, Security Against CCA, Limitations of Private Key Cryptography

UNIT 2

Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN.

UNIT 3

Reconnaissance: Information Gathering Methodology, Locate the Network Range, Active and Passive reconnaissance. Scanning: Scanning, Elaboration phase, active scanning, DNS Zone transfer. Detecting live systems on the target network, Discovering services running /listening on target systems, Understanding port scanning techniques, Identifying TCP and UDP services running on the target network, Understanding active and passive fingerprinting.

UNIT 4

Trojans and Backdoors: Effect on Business, Trojan, Overt and Covert Channels, Working of Trojans, Different Types of Trojans, Different ways a Trojan can get into a system, Indications of a Trojan Attack. Sniffers: Definition of sniffing, Sniffer working, Passive Sniffing, Active Sniffing, Ethreal tool, Man-in-the-Middle Attacks, Spoofing and Sniffing Attacks, ARP Poisoning and countermeasures.
Denial of Service: Goal of DoS (Denial of Service), Impact and Modes of Attack.

UNIT 5

Understanding Session Hijacking, Spoofing vs Hijacking, Steps in Session Hijacking, Types of Session Hijacking, TCP Concepts 3 Way and shake, Sequence numbers. ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing. Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Securing Wireless Networks.

REFERENCES:-

1. Cryptography and Network Security, W. Stallings , Prentice Hall, 5th Edition, 20102.
2. Network Security Essentials, William Stallings ,Prentice Hall, 5th Edition, 2013
3. Firewalls and Internet Security, William R. Cheswick and Steven M. Bellovin, Addison-Wesley Professional, 2ndEdition, 2003.
4. Hackers Beware, Eric Core, EC-Council Press, 2003

MT112: ADVANCED COMPUTER ARCHITECTURE **L T P C**
3 1 0 4

UNIT 1

Review of Basic Organization and Architectural Techniques: RISC processors, Characteristics of RISC processors, RISC Vs CISC, Classification of Instruction Set Architectures, Review of performance measurements, Basic parallel processing techniques: instruction level, thread level and process level, Classification of parallel architectures.

UNIT 2

Instruction Level Parallelism: Basic concepts of pipelining, Arithmetic pipelines, Instruction pipelines, Hazards in a pipeline: structural, data, and control, Hazards, Overview of hazard resolution techniques, Dynamic instruction scheduling, Branch prediction techniques, Instruction-level parallelism using software approaches, Superscalar techniques, Speculative execution

UNIT 3

Memory Hierarchies: Basic concept of hierarchical memory organization, Main memories, Cache memory design and implementation, Virtual memory design and implementation, Secondary memory technology, RAID.

UNIT 4

Thread Level Parallelism: Centralized vs. distributed shared memory, Interconnection topologies, Multiprocessor architecture, Symmetric multiprocessors, Cache coherence problem, Synchronization, Memory consistency, Multicore architecture, Review of modern multiprocessors.

UNIT 5

Process Level Parallelism: Distributed computers, Clusters, Grid, Mainframe computers. **Peripheral Devices:** Bus structures and standards, Synchronous and asynchronous buses, Types and uses of storage devices, Interfacing I/O to the rest of the system, Reliability and availability, I/O system design, Platform architecture.

REFERENCES:-

1. Hennessey and Patterson, "Computer Architecture: A quantitative Approach", Morgan Kaufman.
2. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill
3. Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing" McGraw-Hill international Edition

MT113: NEURAL NETWORK **L T P C**
3 1 0 4

UNIT 1

Introduction: Human Brain, Introduction to Biological Neural Networks, Basic concepts of Neural Networks, Characteristics of Neural Networks, Terminologies, Models of Neuron, Neural Network Architectures, Basic data structures, Directed graphs, Neural Network applications.

UNIT 2

Supervised learning, Unsupervised learning, Re-inforcement learning, Knowledge Representation, Learning rules, Error correction learning, Memory based learning, Hebbian learning, Competitive learning, Boltzmann learning, Single layer perceptron, Multilayer perceptron, Back propagation,

UNIT 3

Adaptive networks, Supervised Learning Neural Networks, Decision-based neural networks, Hierarchical neural networks, Radial basis function networks, RBF Learning strategies, Comparison of RBF Networks and Multilayer perceptrons,

UNIT 4

Stochastic Processes, Stochastic Networks, Stimulated Annealing, Boltzmann machine, Sigmoid Belief Networks, Helmholtz machine, Support vector machines, Classification of linearly separable patterns,

UNIT 5

Adaptive Resonance Theory, Committee machine, Mixture of expert model, Principal component analysis of Hebbian Learning, Kohonen Self Organizing maps, Network architectures for Temporal processing, Recurrent networks.

REFERENCES:-

1. S. Haykin, “Neural Networks a comprehensive Foundation” second edition, Prentice-Hall India.
2. B. Yegnanarayana, ―Artificial Neural Networks‖, PHI
3. Jacek M. Zurada, Introduction to artificial neural systems, Jaico Publ. House, 1994.
4. Anderson, ―An introduction to Artificial Neural Networks‖, Prentice Hall
5. James A Freeman, David M Skapura, ―Neural Networks-Algorithms, Applications and Programming Techniques,‖ Person Education.

MT114: DISTRIBUTED DATABASES

L	T	P	C
3	1	0	4

UNIT 1

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

UNIT 2

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, enforcing serializablity by Locks, multiple lock modes, Architecture for locking scheduler.

UNIT 3

Introduction to distributed databases, advantages and disadvantages of distributed database, additional functions of Distributed database, distributed DBMS, Distributed Transactions Management, Fragmentation and Replication Techniques, Fragmentation schema, allocation schema data replication.

UNIT 4

Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, recovery techniques used for ensuring atomicity, Recovery with Concurrent Transactions, Checkpoints, Algorithm for recovery.

UNIT 5

Distributed Query Processing, Semi joins, general queries Cost based query optimization for Distributed database, integrity constraints in distributed database, Distributed Deadlock.

REFERENCES:-

1. Silberschatz, orth and Sudershan, Database System Concept, Mc Graw Hill
2. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
3. Ceei and Pelagatti,'Distributed Database', TMH.
4. M.Tamer Ozsu, 'Principles of distributed database Systems' second edition Pearson education

MT121: ADVANCED OPERATING SYSTEMS

L	T	P	C
3	1	0	4

UNIT 1

Introduction: Operating system concept - processes and threads, process model, process creation, process termination, process hierarchies, and process states, Implementation of processes, Threads- Thread model, thread usage, Implementation of threads in user space and kernel, Hybrid implementations.

UNIT 2

Inter Process Communication: Race conditions, critical regions, Mutual Exclusion with busy waiting, sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing; Scheduling- scheduling in batch systems, Interactive systems, Real time systems, Thread scheduling.

UNIT 3

Deadlocks: Introduction, Deadlock Detection and Recovery – Deadlock Detection with one resource of each type, with multiple resource of each type, recovery from deadlock; Deadlock Avoidance, Deadlock Prevention

UNIT 4

Memory and Device Management: Introduction, Swapping, Paging, Virtual memory – Demand paging, page replacement Algorithms; File System Management- Organization of File System, File Permissions, MS DOS and UNIX file system case studies, NTFS; Device Management- I/O Channels, Interrupts and Interrupt Handling, Types of device allocation.

UNIT 5

Distributed Operating Systems: Distributed operating system concept – Architectures of Distributed Systems, Distributed Mutual Exclusion, Distributed Deadlock detection, Agreement protocols, Threads, processor Allocation, Allocation algorithms , Distributed File system design; Real Time Operating Systems: Introduction to Real Time Operating Systems, Concepts of scheduling , Real time Memory Management

REFERENCES:-

1. Mukesh Singhal and Niranjan, “Advanced Concepts in Operating Systems”, TMH, 1st Edition, 2001
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Pearson Education, 2nd Edition, 2006.
3. Andrew S. Tanenbaum, “Distributed Operating Systems”, Pearson Education, 2nd Edition, 2001
4. Pradeep K. Sinha, “Distributed Operating Systems and concepts”, PHI, First Edition, 2002

MT122: DATA STRUCTURE AND ALGORITHM DESIGN **L T P C**
3 1 0 4

UNIT 1

Introduction: Algorithms, analysis of algorithms, Growth of Functions, Master's Theorem, Designing of Algorithms. Sorting and order Statistics: Heap sort, Quick sort, Sorting in Linear time, Medians and Order Statistics.

UNIT 2

Advanced Data Structure: Red-Black Trees, Augmenting Data Structure. B-Trees, Binomial Heaps, Fibonacci Heaps, Data Structure for Disjoint Sets.

UNIT 3

Decrease and Conquer: Insertion Sort, Depth First Search and Breadth First Search, Topological Sorting, algorithms for Generating Combinatorial Objects.
Greedy Method: minimum-cost spanning trees: Prim's and Kruskal's algorithms – Single source shortest paths: Dijkstra's algorithm and Bellman Ford algorithms.

UNIT 4

Dynamic Programming: Concepts**,** Dynamic programming v/s. divide and conquer, Applications-Matrix chain multiplication, Optimal binary search trees, All pairs shortest path problem-Warshal's and Floyd's algorithms, Longest Common sequence(LCS).

UNIT 5

Decision Trees, P, NP, NP-complete problems, NP-hard problem. Randomized Algorithms, String Matching, Approximation Algorithms.

REFERENCES:-

1. Cormen, Leiserson, Rivest and Stein, "Introduction to Algorithms", 2nd Edition, by, McGraw-Hill, 2000.
2. E. Horowitz, and S. Sahni, "Fundamentals of Computer Algorithms", University Press.
3. Anany V. Levitin, Introduction to the Design and Analysis of Algorithms, Pearson.
4. Sridhar, "Design and Analysis of Algorithms" Oxford Press.

MT123: DISTRIBUTED SYSTEM **L T P C**
3 1 0 4

UNIT 1

Characterization of Distributed Systems: Resource sharing and the Web Challenges. Architectural models, Fundamental Models.
Theoretical Foundation for Distributed System: Limitation of Distributed system, Logical clocks, Lamport's & vectors logical clocks.

UNIT 2

Concepts in Message Passing Systems: Message Ordering, Causal ordering of messages, global state, and termination detection.
Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of Mutual exclusion, Token based and non token based algorithms,

UNIT 3

Distributed Deadlock Detection: resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms
Agreement Protocols: classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem,

UNIT 4

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory,
Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, obtaining consistent Checkpoints, Recovery.

UNIT 5

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.
Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering,

REFERENCES:-

1. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, Tata McGraw-Hill Edition.
2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.
3. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
4. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
5. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill

MTL11: DISTRIBUTED DATABASE LAB

L	T	P	C
0	0	4	2

Lab experiments are based on the database design on oracle and visual basic through which students are required to develop a database application system and document the conceptual and logical design of the distributed database.

MTL21: DATA STRUCTURE AND ALGORITHM DESIGN LAB

L	T	P	C
0	0	4	2

Lab experiments are based on the syllabus prescribed for Data Structure and Algorithm Design viz. Heap sort, Quick sort, Insertion Sort, Depth First Search, Breadth First Search, Prim, Kruskal, Dijkstra, Bellman Ford, Warshal and Floyd algorithms etc.

MTE11: PARALLEL ALGORITHM

L	T	P	C
3	1	0	4

Unit 1

Parallel Algorithm Design **:** Boundary Value Problem, Finding the Maximum, Complexity measure for parallel algorithms.

Unit 2

Parallel Combinatorial Algorithms: Permutations with and without repetitions, combinations, derangements.

Unit 3

Parallel Searching Algorithms: Maximum/ minimum, median, k^{th} largest/smallest element, Parallel sorting algorithms.

Unit 4

Parallel Graph Algorithms: Parallel graph search and tree traversal algorithms, parallel algorithms for connectivity problems, parallel algorithms for path problems.

Unit 5

Programming for Parallel Algorithms: Shared-Memory Programming with OpenMP, Message-Passing Programming, Performance Analysis.

REFERENCES:-

1. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, John Wiley.
2. Pattern Recognition principles: Julus T. Tou and Rafel C. Gonzalez, Addision –Wesley.
3. A probabilistic theory of pattern recognition, Luc Devroye, László Györfi, Gábor Lugosi, Springer, 1996.
4. Pattern classification, Richard O. Duda, Peter E. Hart and David G. Stork, Wiley, 2001.
5. Pattern recognition and machine learning, Christopher M. Bishop, Springer 2006.

MTE12: PATTERN RECOGNITION

L	T	P	C
3	1	0	4

Unit 1

Pattern recognition fundamentals: Basic concepts of pattern recognition, fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model.

Unit 2

Bayesian decision theory: Minimum-error-rate classification, Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, Discrete features, Missing and noisy features, Bayesian networks (Graphical models) and inferencing.

Unit 3

Maximum-likelihood and Bayesian parameter estimation: Maximum-Likelihood estimation: Gaussian case, Maximum a Posteriori estimation, Bayesian estimation: Gaussian case, Problems of dimensionality, Dimensionality reduction: Fisher discriminant analysis, PCA Expectation-Maximization method: Missing features

Unit 4

Sequential Models: State Space, Hidden Markov models, Dynamic Bayesian, Non-parametric techniques for density estimation: Parzen-window method, K-Nearest Neighbour method
Linear discriminant functions: Gradient descent procedures, Perceptron criterion function, Minimum-squared-error procedures, Ho-Kashyap procedures, Support vector machines

Unit 5

Unsupervised learning and clustering: Unsupervised maximum-likelihood estimates, Unsupervised Bayesian learning, Criterion functions for clustering, Algorithms for clustering: K-means, Hierarchical and other methods, Cluster validation, Low-dimensional representation and multidimensional scaling (MDS).

REFERENCES:-

1. Pattern Recognition principles: Julus T. Tou and Rafel C. Gonzalez, Addision –Wesley.
2. Pattern recognition and machine learning, Christopher M. Bishop, Springer 2006.
3. A probabilistic theory of pattern recognition, Luc Devroye, László Györfi, Gábor Lugosi, Springer, 1996.
4. Pattern classification, Richard O. Duda, Peter E. Hart and David G. Stork, Wiley, 2001.
5. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, John Wiley.

MTE13: CLUSTER AND GRID COMPUTING

L	T	P	C
3	1	0	4

Unit 1

Cluster Computing: Introduction to concepts in Cluster based distributed computing Hardware technologies for cluster computing and software for cluster computing, and different Software Architecture for Cluster Computing.

Unit 2

Resource management and scheduling: Managing, cluster resources: single system images, system level middleware, distributed task scheduling, monitoring and administering system resources Parallel I/O and Parallel Virtual File System. Scheduling: Condor, Maui Scheduler, Portable Batch System (PBS)

Unit 3

Grid Computing: Grids and Grid Technologies, Programming models and Parallelization Techniques, Grid Security Infrastructure, Setting up Grid, deployment of Grid software and tools, and application execution.

Unit 4

Standard application development tools and paradigms: Performance evaluation tools, HINT, netperf, netpipe, ttcp, Iperf.message

Unit 5

Data Management: Application Case Study: Molecular Modeling for Drug Design and Brain Activity Analysis, Resource management and scheduling.

REFERENCES:-

1. William Gropp, Ewing Lusk, Thomas Sterling, Beowulf Cluster Computing with Linux, 2nd edition, MIT Press.
2. Bart Jacob, Michael Brown, Introduction to grid computing.
3. MPI The Complete Reference - 2nd Ed by Marc Snir, et. al., The MIT Press, 1998.
4. Parallel Programming with MPI by Peter Pacheco, Morgan Kaufmann, 1998.
5. Gregory F. Pfister, In Search of Clusters: The ongoing battle in lowly parallel computing, Second Edition, Prentice Hall Publishing Company, 1998.

MTE14: WIRELESS & MOBILE COMMUNICATION

L	T	P	C
3	1	0	4

Unit 1

Introduction: Network Technologies and Cellular Communications, Discussion on Bluetooth &GSM. Introduction to Mobile Computing: novel applications, limitations, and architecture.
(Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

Unit 2

Mobile Architecture: Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

Unit 3

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time out freezing, Selective retransmission, Transaction oriented TCP.

Unit 4

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

Unit 5

Protocols and Tools: Wireless Application Protocol WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME, Latest Technologies.

REFERENCES:-

1. Mobile and Personal communication System and Services- Raj Pandya
2. Wireless Communication and Networks- William Stallings.
3. Fundamentals of Wireless Communication, David Tse and Pramod Viswanath, Cambridge University Press, 2005
4. Wireless and Personal Communications Systems, Vijay Garg, Joseph Wilkes, Prentice-Hall, Englewood Cliffs, NJ, 1996.

MTE15: MACHINE LEARNING

L	T	P	C
3	1	0	4

UNIT 1

Introduction: Defining learning systems, Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation, supervised learning, unsupervised learning, Reinforcement learning, learning algorithms.

UNIT 2

Decision Tree Learning: Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute: entropy and information gain. Searching for simple trees and computational complexity, Overfitting, noisy data, and pruning.

UNIT 3

Ensemble Learning: Bagging, boosting, and Ada-Boost. Experimental Evaluation of Learning Algorithms, Measuring the accuracy of learned hypotheses. Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.

UNIT 4

Rule Learning: Translating decision trees into rules. Artificial Neural Networks: Neurons and biological motivation. Linear threshold units. Perceptrons: representational limitation and gradient descent training. Multilayer networks and back propagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

UNIT 5

Support Vector Machines: Maximum margin linear separators. Kernels for learning non-linear functions. Bayesian Learning: theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logisitic regression. Bayes nets and Markov nets for representing dependencies. Instance-Based Learning: Constructing explicit generalizations versus comparing to past specific examples. k-Nearest-neighbor algorithm, Case-based learning.

REFERENCES:-

1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)
3. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge University Press.
4. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001
5. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995

MTE16: FUZZY SYSTEMS

L	T	P	C
3	1	0	4

UNIT I

Introduction, Basic Types, Basic Concepts, Representations of Fuzzy Sets, Extension Principle for Fuzzy Sets, Types of Operations. Fuzzy Complements, Fuzzy Intersections: t- Norms., Fuzzy Unions: t-Conorms, Combinations of Operations. Aggregation Operations. Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals, Arithmetic Operations on Fuzzy Numbers, Fuzzy Equations

UNIT 2

Crisp versus Fuzzy Relations, Projections and Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on a Single Set. Fuzzy Equivalence Relations, Fuzzy Compatibility Relations. Fuzzy Ordering Relations, Fuzzy Morphisms, Sup-i Compositions of Fuzzy Relations., InfCompositions of Fuzzy Relations.

UNIT 3

Fuzzy Measures, Fuzzy Sets and Possibility Theory, Classical Logic: An Overview. Multivalued Logics. Fuzzy Propositions. Fuzzy Quantifiers. Linguistic Hedges. Inference from Conditional Fuzzy Propositions. Inference from Conditional and Qualified Propositions. Inference from Quantified Propositions, Information and Uncertainty, Nonspecificity of Fuzzy Sets. Fuzziness of Fuzzy Sets. Principles of Uncertainty

UNIT 4

Fuzzy Expert Systems: An Overview. Fuzzy Implications. Selection of Fuzzy Implications. Multiconditional Approximate Reasoning. The Role of Fuzzy Relation Equations, Fuzzy Controllers: Overview, Fuzzy Neural Networks. Fuzzy Automata. Fuzzy Dynamic Systems.

UNIT 5

Fuzzy Databases. Fuzzy Information Retrieval, Individual Decision Making, Multiperson Decision Making, Multicriteria Decision Making, Multistage Decision Making, Fuzzy Systems and Genetic Algorithms.

REFERENCES:-

1. George J. Klir, Bo Yuan, "Fuzzy Sets and Fuzzy Logic", PHI
2. Witold Pedrvcz and Femando Gomide. "An Introduction to Fuzzy Sets", PHI

MTE21: REAL TIME SYSTEMS

L	T	P	C
3	1	0	4

Unit 1

Real-time systems: Real-time systems models, Types of real-time systems, internal structure of real-time systems, Performance measures, Examples of real-time systems and real-world applications, Modeling & Designing real-time systems

Unit 2

Real-Time Process Management: Task scheduling for Uniprocessor systems, handling priorities with critical section, interrupts, task allocation & scheduling for multiprocessor systems, adaptive scheduling.

Unit 3

Programming Environment: In depth Knowledge of RTOS programming languages, tools & techniques.

Unit 4

Real-Time System Design: Design techniques for Reliability, Fault Tolerance & other application specific quality considerations.

Unit 5

Trends in Real-Time System Design & Development in fields such as Robotics. Introduction to research topics.

REFERENCES:-

1. A.C. Shaw, Real-Time Systems and Software, Wiley.
2. J.E. Cooling, Real-Time Software Systems, International Thompson Computer Press.
3. Real-Time Systems Design and Analysis, P.H. Laplante, IEEE Press.
4. Real-Time Systems, J. Liu, Prentice-Hall, 2000.
5. Real-Time Computer Control, R. Bennett, Prentice-Hall.
6. Real-Time Systems, C.M. Krishna and K.G. Shin, McGraw-Hill.

MTE22: SOFTWARE METRICS **L T P C**
3 1 0 4

Unit 1

Software Quality Assurance Framework: What is Quality? Software Quality Assurance, Components of Software Quality Assurance, Software Quality Assurance Plan. Steps to develop and implement a Software Quality Assurance Plan

Unit 2

Quality Standards: ISO 9000 and Comparison ISO Standards, CMM, CMMI, PCMM, 3 Sigma, 6 Sigma, Software Quality Models.

Unit 3

Measurement basics: What is Software Metrics?, Application Areas of Metrics, Categories of Metrics, Measurement Scale, Axiomatic Evaluation of Metrics on Weyuker's Properties. Analyzing the Metric Data: Summary statistics for preexamining data, Metric Data Distribution, Outlier Analysis, Correlation Analysis, Exploring Analysis.

Unit 4:

Measuring Structure and Size: Size Estimation, Halstead Software Science Metrics, Information flow Metrics, Measuring Quality, Software Quality metrics based on Defects, Usability Metrics, Testing Metrics, Reliability Models.

Unit 5

Object Oriented Metrics: Coupling Metrics, Cohesion Metrics, Inheritance Metrics, Size Metrics, Reuse Metrics,
Empirical software engineering, research in software quality.

REFERENCES:-

1. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education (Singapore) Pvt. Ltd., 2002.
2. Norman E. Fenton and Shari Lawrence, "Software Metrics", PfleegerThomson, 2003.
3. D. Galin, "Software Quality Assurance: From Theory to Implementation", Addison Wesley.
4. Allan C. Gillies, "Software Quality: Theory and Management", Thomson Learning, 2003
5. Mike Konrad and Sandy Shrum, CMMI, Mary Beth Chrissis, Pearson Education (Singapore) Pvt Ltd, 2003.
6. Mordechai Ben Menachem/Garry S. Marliss, "Software Quality", Thomson Learning.

MTE23: SOFTWARE QUALITY ENGINEERING

L	T	P	C
3	1	0	4

UNIT 1:

Introduction
Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT 2:

Software Quality Metrics
Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT 3:

Software Quality Management and Models
Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT 4:

Software Quality Assurance
Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT 5:

Software Verification, Validation & Testing:
Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

REFERENCES:-

1. Jeff Tian, Software Quality Engineering (SQE), Wiley-Interscience, 2005; ISBN 0-471-71345-7.
2. Metrics and Models in Software Quality Engineering, Stephen H. Kan, Addison- Wesley (2002), ISBN: 0201729156

MTE24: WIRELESS MOBILE NETWORKS

L	T	P	C
3	1	0	4

UNIT 1

Fundamental of Wireless Communication Technology, Wireless Network, Wireless Characteristics, Channels, Propagation. Types of wireless systems and their parameters, Satellite System, Cellular System, GSM, Wireless LAN, PAN, MAN and WANs, IEEE 802.11 Standards.

UNIT 2

Infrastructure and Infrastructure less Network, Mobile Ad hoc Network (MANET), Wireless Sensor Network, Properties of MANET, MANET Applications, MAC (Hidden and Exposed terminal problems), MAC Protocol for MANET.

UNIT 3

Security Definition, Services, Mechanisms, Spread spectrum, Frequency hopping, Encryption, Integrity check-sums, Assessment issues specifically related to wireless, Jamming, Interception, Spoofing, Fraud, Satellite Jamming, Theft of service – entertainment services on downlink, Hidden signals

UNIT 4

Routing Protocols for Ad Hoc Wireless Networks Issues in Designing a Routing Protocol for Ad hoc Wireless Networks, Classifications of Routing Protocols. Transport Layer for Ad Hoc Wireless Networks Issues in Designing a Transport layer protocol for Ad hoc Wireless Networks, Design goal s of a Transport layer protocol for Ad hoc Wireless Networks, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks.

UNIT 5

Basics of Wireless, Sensors and Applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications
Data Retrieval in Sensor Networks: Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

REFERENCES:-

1. Ad Hoc Wireless Networks, Architecture and Protocols by C. Siva Ram Murthy
2. Wireless security handbook by Aron E. Earle.
3. Handbook of research on wireless security by Yan zhang jun zheng miao ma.

MTE25: NATURAL LANGUAGE PROCESSING

L	T	P	C
3	1	0	4

Unit 1

Introduction: Introduction to the Morphology, Syntax, Semantics by linking the "linguistics view" (computational linguistics) with the "artificial intelligence view" (natural language processing).

Unit 2

Morphology: Analysis and generation of language on word level: e.g. problems with compounding and idiomatic phrases, homophonous strings as well as loan words and their processing using e.g. finite state automata as well as semantic networks. Ambiguities in words like "pen" and "pipe", but will also discuss some complex strings.

Unit 3

Syntax: Analysis and generation of language on phrasal and sentence level: e.g. applications such as machine translation and grammar checking and the processing using phase structure grammars as well as unification based formalisms and relating those formalisms to recursive transition networks (RTNs) as well as augmented transition networks (ATNs).

Unit 4

Semantics: Language ambiguities on the level of "meaning": represented by case structures and conceptual dependency structures. We will look at famous utterances such as: Colourless green ideas sleep furiously. And will discuss why the machine runs into problems during analysis, and how these problems can be overcome.

Unit 5

Applications of NLP: Machine Translation, Grammar Checkers Dictation, Automatic Document Generation, NL Interfaces.

REFERENCES:-

1. Daniel Jurafsky, James H. Martin "Speech and Language Processing" Second Edition, Prentice Hall, 2008.
2. Chris Manning and Hinrich Schütze, "*Foundations of Statistical Natural Language Processing"*, MIT Press. Cambridge, MA: May 1999.
3. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
4. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.

MTE26: APPLIED CRYPTOGRAPHY

L	T	P	C
3	1	0	4

UNIT 1

Basic Encryption and Decryption: introduction to Ciphers, Monoalphabetic Substitutions such as the Caesar Cipher, Cryptanalysis of Monoalphabetic Ciphers, Polyalphabetic Ciphers such as Vigenere Tableaux, Cryptanalysis of Polyalphabetic Ciphers, Perfect Substitution Cipher such as the Vernam Cipher, Stream and Block Ciphers.

UNIT 2

Encryption; authentication; symmetric cryptography, asymmetric cryptography: public-key cryptosystems; digital signatures, message authentication codes. Steganography, One-way functions; pseudo-randomness and random number generators.

UNIT 3

Remote user authentication, notions of security; zero knowledge/ interactive proofs, multi-party cryptographic protocols, key exchange and applications.

UNIT 4

Cryptanalysis of cryptographic primitives and protocols, such as by side-channel attacks, differential cryptanalysis, or replay attacks; and cryptanalytic techniques on deployed systems.

UNIT 5

Advanced Topics - ECC, DNA cryptography, quantum cryptography, Digital Watermarking.
Digital signatures: Definitions and applications, Lamport and Merkle schemes. overview of signatures based on discrete-log. certificates and trust management. , SSL/TLS and IPsec, Privacy mechanisms.

REFERENCES:-

1. Handbook of Applied Cryptography by A. Menezes, P. Van Oorschot, S. Vanstone.
2. Cryptography by Behrouz A. Forouzan,TMH
3. Cryptography and Network Security by Stalling, PHI
4. Cryptography & security services , Mechanism & application By Mogollon , Manuel , Cyber tech. Pub.
5. Cryptography and hardware security By Stalling, W PHI

MTE31: HUMAN COMPUTER INTERACTION **L T P C**
3 1 0 4

UNIT 1

Introduction: Importance of user Interface –Characteristics of graphical and web user interfaces, importance of good design. Benefits of good design, Principles of good Screen design.

UNIT 2

System menus and navigation schemes, kinds of windows, device based controls, screen based controls, test and messages.

UNIT 3

Feedback, guidance and assistance, Internationalization and Accessibility, graphics, icons and images, colors, layout windows and pages

UNIT 4

Interaction design - introduction, goals, usability. Conceptualizing interaction problem space, conceptual models, interface metaphors, interaction paradigms, cognition, conceptual framework for cognition, collaboration, communication, social mechanisms conceptual frame work

UNIT 5

Affective aspects, Expressive interface, user frustration agents process of interaction design, activities, characteristics, practical issues, life cycle models, design , prototyping and conceptual design, physical design, evaluation, framework, testing modeling users-kinds of tests, doing user testing, experiments, predictive model.

REFERENCES:-

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
   Designing the user interface. 3rd Edition Ben Sheidermann, Pearson Education Asia.
2. Preece, Rogers, Sharp, “interaction design”, John Wiley 2002.
3. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education
4. Sheiderman B Desiging the user interface, “Strategies for Effective Human Computer Interaction” , 2nd ed. Addison Wesley , 1992
5. Sudifte AG , “Human Computer Interface Design” , 2nd ed, Macmillan ,1995

MTE32: BIOINFORMATICS

L	T	P	C
3	1	0	4

Unit 1

Introduction: biology, physics: Biological hierarchy, Information stages, Physical processes,
Methods of gene sequencing: Detailed discussion on Sequences searching methods.

Unit 2

Gene expression: Current and prospective methods of gene profiling. Data acquisition. Data standardization. Linear approximations of data; DNA chips, Protein targeting, Data normalization, Linear view.

Unit 3

Statistics approaches: Probabilistic notions, Multivariate issues, Clustering, Information handling, Experimental and computational methods of structure determination for proteins and nucleic acids.

Unit 4

Ontology: Annotation of genes, their products and functions. System biology, evolution, hierarchy, Medical informatics, Software support: Software availability, Software targets, Text parsing, BioPerl. Statistics, R-system

Unit 5

Recent Advances & Applications of Bio-Informatics: Recent trends in Computing with bio-systems.

REFERENCES:-

1. David W. Mount, "Bioinformatics, Sequence and Genome Analysis", Cold Spring Harbor Laboratory Press
2. Andreas D. Baxevanis, "Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins", Second Edition.
3. D.E. Krane and M.L. Raymer, "Fundamental Concepts of Bioinformatics", Pearson Education, 2003.
4. B. Bergeron, "Bioinformatics Computing", Prentice –Hall, 2003.
5. Richard Durbin, Sean R. Eddy, Anders Krogh, Graeme Mitchison, "Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids", Cambridge University Press.

MTE33: INFORMATION SECURITY AND CYBER LAWS

L	T	P	C
3	1	0	4

UNIT 1

Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages 18 Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Principles of Information Security: Confidentiality, Integrity Availability and other terms in Information Security.

UNIT 2

Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards. Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems.

UNIT 3

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls: Design and Implementation Issues, Policies.

UNIT 4

IT Act; The rights the various parties have with respect to creating, modifying, using distribution. Computer Software and Intellectual Property-Objective, Copyright Protection, Reproducing, Defenses, Patent Protection. Database and Data Protection-Objective.

UNIT 5

Introduction to Trade mark – Trade mark Registration Process – Post registration Procedures – Trade mark maintenance. Introduction to Copyrights – Principles of Copyright Principles -The subjects Matter of Copy right – The Rights Afforded by Copyright Law – Copy right Ownership. Introduction to Trade Secret – Maintaining Trade Secret.

REFERENCES:-

1. Godbole," Information Systems Security", Willey
2. Merkov, Breithaupt," Information Security", Pearson Education
3. Sood,"Cyber Laws Simplified", Mc Graw Hill
4. Furnell, "Computer Insecurity", Springer
5. Schou, Shoemaker, " Information Assurance for the Enterprise", Tata McGraw Hill
6. IT Act 2000

MTE34: ADVANCED NETWORKS

L	T	P	C
3	1	0	4

UNIT 1

Requirements , Network architecture , Networking principles, Network services and Layered architecture , Network services and Layered architecture , Future networks (Internet , ATM , Cable TV, Wireless – Bluetooth, Wi-Fi, WiMax, Cell phone)

UNIT 2

Virtual circuits, Fixed size packets, Small size packets, Integrated service, History, Challenges, ATM Network protocols, IP over ATM, Wireless networks : Wireless communication basics, architecture, mobility management, wireless network protocols. Ad-hoc networks Basic concepts, routing; Bluetooth (802.15.1), Wi-Fi (802.11), WiMAX (802.16), Optical Network : links, WDM system, Optical LANs, Optical paths and networks.

UNIT 3

Control of networks: objectives and methods of control, Circuit switched networks, ATM networks. Mathematical background for control of networks like Circuit switched networks, Datagram and ATM networks

UNIT 4

Routing architecture, Routing between peers (BGP) , IP switching and Multi-Protocol Label Switching (MPLS), MPLS Architecture and related protocols, Traffic Engineering (TE) and TE with MPLS, NAT and Virtual Private Networks (L2, L3, and Hybrid), CIDR –Introduction, CIDR addressing, CIDR address blocks and Bit masks.

UNIT 5

Mobile IP- characteristics, Mobile IP operation, Security related issues. Mobility in networks, Voice and Video over IP (RTP, RSVP, QoS) IPv6: Why IPv6, basic protocol, extensions and options, support for QoS, security, etc., neighbour discovery, auto-configuration, routing. Application Programming Interface for IPv6.

REFERENCES:-

1. Tanenenbaum, " Computer Network",PHI.
2. D. Bertsekas , R Gallagar ,"Data Networks and Internets" PHI.
3. Srinivasan Keshav" An Engineering Approach To Computer Networking ",Pearson.