School of Computer & Systems Sciences

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

Course Structure & Syllabus

A student shall have to earn a minimum of 50 credits at the end of II year in order to be eligible for the award of M.Tech. Degree

Semester I

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Design and Analysis of Algorithms</td>
<td>CS-773</td>
</tr>
<tr>
<td>2.</td>
<td>Elective I</td>
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<tr>
<td>3.</td>
<td>Elective II</td>
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<td>4.</td>
<td>Elective III</td>
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<td>5.</td>
<td>Elective IV</td>
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Semester II

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<tr>
<th>S.No.</th>
<th>Course Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>1.</td>
<td>Elective V</td>
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<tr>
<td>2.</td>
<td>Elective VI</td>
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<td>3.</td>
<td>Elective VII</td>
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<td>4.</td>
<td>Elective VIII</td>
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<td>5.</td>
<td>Elective IX</td>
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Semester III

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>1</td>
<td>Research Methodology</td>
<td>CS-765</td>
</tr>
<tr>
<td>2</td>
<td>Academic Ethics and Technical Writing</td>
<td>CS-774</td>
</tr>
<tr>
<td>3</td>
<td>Research Reading and Seminar</td>
<td>CS-775</td>
</tr>
</tbody>
</table>

Semester IV

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Dissertation</td>
<td></td>
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</tbody>
</table>
### List of Electives Courses for M.Tech. Semester I and II

<table>
<thead>
<tr>
<th>No.</th>
<th>Course Title</th>
<th>Code</th>
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<tbody>
<tr>
<td>1.</td>
<td>Advance Scientific Computing</td>
<td>CS-750</td>
</tr>
<tr>
<td>2.</td>
<td>Advanced Software Engineering</td>
<td>CS-729</td>
</tr>
<tr>
<td>3.</td>
<td>Artificial Intelligence</td>
<td>CS-708</td>
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<tr>
<td>4.</td>
<td>Big Data Analytics</td>
<td>CS-751</td>
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<tr>
<td>5.</td>
<td>Grid and Cloud Computing</td>
<td>CS-771</td>
</tr>
<tr>
<td>7.</td>
<td>Computer Architecture</td>
<td>CS-705</td>
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<tr>
<td>8.</td>
<td>Computer Vision</td>
<td>CS-752</td>
</tr>
<tr>
<td>9.</td>
<td>Data Communication and Computer Networks</td>
<td>CS-703</td>
</tr>
<tr>
<td>10.</td>
<td>Data Mining and Knowledge Discovery</td>
<td>CS-715</td>
</tr>
<tr>
<td>11.</td>
<td>Data Structure</td>
<td>CS-776</td>
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<tr>
<td>12.</td>
<td>Data Warehousing and Data Mining</td>
<td>CS-753</td>
</tr>
<tr>
<td>13.</td>
<td>Database Management Systems</td>
<td>CS-706</td>
</tr>
<tr>
<td>14.</td>
<td>Digital Image Processing</td>
<td>CS-754</td>
</tr>
<tr>
<td>15.</td>
<td>Embedded Systems</td>
<td>CS-722</td>
</tr>
<tr>
<td>17.</td>
<td>Graph Theory</td>
<td>CS-756</td>
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<tr>
<td>18.</td>
<td>Large Scale Graph Algorithms and Application</td>
<td>CS-777</td>
</tr>
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<td>19.</td>
<td>Machine Learning</td>
<td>CS-714</td>
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<tr>
<td>20.</td>
<td>Maximum Entropy Modeling and Application</td>
<td>CS-757</td>
</tr>
<tr>
<td>21.</td>
<td>Micro Fabrication Technologies</td>
<td>CS-758</td>
</tr>
<tr>
<td>22.</td>
<td>Mobile Ad Hoc Networks</td>
<td>CS-720</td>
</tr>
<tr>
<td>23.</td>
<td>Modeling and Simulation</td>
<td>CS-778</td>
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<tr>
<td>24.</td>
<td>Multicast Communication</td>
<td>CS-759</td>
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<td>25.</td>
<td>Natural Language Processing</td>
<td>CS-760</td>
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<tr>
<td>26.</td>
<td>Operating System</td>
<td>CS-704</td>
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<tr>
<td>27.</td>
<td>Network Security</td>
<td>CS-761</td>
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<tr>
<td>28.</td>
<td>Object Oriented Programming</td>
<td>CS-735</td>
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<td>29.</td>
<td>Object Oriented Software Engineering</td>
<td>CS-707</td>
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<tr>
<td>30.</td>
<td>Parallel and Distributed Systems</td>
<td>CS-762</td>
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<tr>
<td>31.</td>
<td>Pattern Classification</td>
<td>CS-763</td>
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<td>32.</td>
<td>Performance Modeling of Computer Communication Networks</td>
<td>CS-764</td>
</tr>
<tr>
<td>33.</td>
<td>Randomized and Approximation Algorithms</td>
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<td>Swarm Intelligence</td>
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<tr>
<td>35.</td>
<td>Services Oriented Architecture</td>
<td>CS-738</td>
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<td>36.</td>
<td>Software Engineering</td>
<td>CS-731</td>
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<td>37.</td>
<td>Software Quality Assurance</td>
<td>CS-767</td>
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<tr>
<td>38.</td>
<td>Theory of Computation</td>
<td>CS-780</td>
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<tr>
<td>39.</td>
<td>Topics in Mathematical Sciences</td>
<td>CS-736</td>
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<tr>
<td>40.</td>
<td>Vehicular Communication Networks</td>
<td>CS-768</td>
</tr>
<tr>
<td>41.</td>
<td>VLSI Design and Testing</td>
<td>CS-769</td>
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<tr>
<td>42.</td>
<td>Web Mining</td>
<td>CS-737</td>
</tr>
<tr>
<td>43.</td>
<td>Wireless Communication and Mobile Computing</td>
<td>CS-718</td>
</tr>
<tr>
<td>44.</td>
<td>Wireless Sensor Networks</td>
<td>CS-770</td>
</tr>
<tr>
<td>45.</td>
<td>MEMS Technology</td>
<td>CS-781</td>
</tr>
<tr>
<td>46.</td>
<td>VLSI Technology</td>
<td>CS-726</td>
</tr>
</tbody>
</table>
School of Computer and Systems Sciences

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

Syllabus

SEMESTER I

Compulsory Course

1. Design and Analysis of Algorithms CS-773


References:
3. T Cormen, C Leisersson, R Rivest, C Stein, Introduction to Algorithms, PHI.

Elective Courses

1. Elective I (see appendix-1)
2. Elective II (see appendix-1)
3. Elective III (see appendix-1)
4. Elective IV (see appendix-1)
SEMESTER II

Elective Courses

1. Elective V (see appendix-1)
2. Elective VI (see appendix-1)
3. Elective VII (see appendix-1)
4. Elective VIII (see appendix-1)
5. Elective IX (see appendix-1)

SEMESTER III

Compulsory Courses

1. Research Methodology        CS-765


References:

2. Academic Ethics and Technical Writing        CS-774

Significance of literature review, Writing scientific report, structure and components of research report, revision, writing project proposal, writing a Research Paper, Citation counting and Impact factor, Science citation index (SCI)/ Science citation index Expended (SCI-E), H-index, Academic Ethics and Plagiarism, Intellectual Property Rights and Patent law.

References:

3. Research Reading and Seminar Course        CS-775

This course should be carried out under the concern supervisor in the area of related research for dissertation as suggested by the supervisor. The related research work should be
presented. The research reading is evaluated by the concern supervisor and seminar is evaluated by the seminar evaluation committee. Research reading and Seminar have equal weightage.

SEMESTER IV

Dissertation (12 credits)

Appendix-1

Optional Courses for Electives I to IX in Semester I and II

1. Advance Scientific Computing  CS-750


References:

2. Advanced Software Engineering CS-729

Overview of Software Engineering, Methods of Analysis and Design of Software Systems: Structured and Object Oriented, Coding Standards and Guidelines, Theoretical Foundation of Testing: Coverage Criterions, Software Testing Techniques and Strategies, Software Debugging; Software Project Metrics and Estimation Techniques: Empirical, Heuristic and Analytical Techniques; Software Project Planning and Scheduling: PERT and CPM; Software Project Crashing; Software Reliability Metrics and Models, Software Availability, Software Risk and Configuration Management; Software Reuse and Re-engineering; CASE Tools and Support; Software Quality Assurance.

References:

3. Artificial Intelligence CS-708

Overview of AI: Foundations, history and sate of art; Problem Solving: Search, Game playing; Knowledge Representation and Reasoning: First Order Logic, building knowledge-bases, Logic based Reasoning Systems, Semantic Networks, Frames; Uncertainty and Reasoning: Bayesian networks, Demster-Shafer theory, Fuzzy Sets; Planning; Machine Learning: learning from observations, Artificial Neural Networks, Reinforcement learning; Intelligent Agents; Natural Language Processing; Robotics

References:

4. Big Data Analytics CS-751

Introduction to Big Data, Data Mining, Data Analytics, Predictive Analysis and Business Intelligence, Large Scale File System: Distributed File System, MapReduce, HDFS and Hadoop, Mining Big Data, Advanced Data Analytics and Machine Learning, Big Data Streams and Real Time Predictive Analysis, Tools and Visualization, Link Analysis, Web Analytics, Collaborative Filtering, Social Network Analysis, Issues, Challenges and Opportunities with Big Data and its Analytics

References:
1. Rajaraman, A., Ullman, J. D., Mining of Massive Datasets, Cambridge University Press, United Kingdom, 2012

5. Grid and Cloud Computing CS-771


References:


Input devices, Video display devices, Basic 2-dimensional and 3-dimensional geometric transformations, Homogeneous coordinate system, Parallel projection, Isometric projection and its construction, Perspective projection, Hidden surface elimination algorithms, Basic illumination models, Gouraud and Phong surface rendering models, Fractals, Transparency, Ray tracing, Representation of curves and surfaces

References:


7. Computer Architecture CS-705


References:


8. Computer Vision  CS-752

Introduction to vision; Camera models; Camera calibration; Multi-view geometry and reconstruction; Edge/ Feature extraction; Correspondence and tracking; 3D structure/ motion estimation; shape from X techniques; Recognition, scene and activity interpretation, video analysis.

References:

9. Data Communication and Computer Networks  CS-703

Data Communication – Analog and digital communications, Channel characteristics, modulation, encoding schemes; Error Detection and correction, Flow control, multiplexing switching, Multiple access techniques, Routing – shortest path algorithms, routing protocols, virtual path routing, Network Protocols – IP, TCP, UDP, FTP, SMTP, etc, Performance Evaluation – Queuing models, Traffic model – deterministic and stochastic

References:

10. Data Mining and Knowledge Discovery  CS-715


Current topics
References:
3. Tan, P., Kumar, V. and Steinbach, M., Introduction to Data Mining, Pearson Education Inc. 2007.

11. Data Structure   CS-776

Introduction to data structures; Analysis of algorithms; Linear lists: Stacks, Queues, Deques; Orthogonal lists; Multilinked structures; Trees: Binary search trees, AVL trees, Red Black trees, M-way and B trees; Hash tables; Priority Queues; Sorting: Quick Sort, Heap sort, Merge sort, External sorting, Shell sort, Bin and Radix sort; Graphs: Topological sort, Shortest path, Network flow problem, Minimum spanning tree, Algorithm design techniques: Greedy algorithms, Divide and Conquer, Dynamic Programming, Randomized algorithms, Backtracking.

References:
3. Wirth, Algorithms + Data Structures = Programs, PHI.

12. Data Warehousing and Data Mining   CS-753

Data Warehouse Definition, Perspectives of DW, Dimensional Modelling, OLAP functions, MDX query language, Architecture, Representation, Design Process, Mapping ER to Star schema, Metadata, ETL- Extractions, Transformation and Loading, Data warehousing to Mining; Data Mining Methodologies - Association Rule Mining, Classification and Prediction, Cluster Analysis; Modern Topics. Practical: Executing MDX queries on SQL Server

References:
13. Database Management Systems  

CS-706

Introduction; Database Architecture; Database Analysis: Entity Relationship Model, Database Design: Relational Model, Integrity Constraints, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF; Query Languages: Relational Algebra, Tuple Calculus, Domain Calculus, SQL; Query Processing: Query Decomposition, Query Optimization; Object Relational Databases, XML Databases, Transactions, Concurrency Control and Recovery System, Parallel and Distributed Databases, Advances in Database Systems and Technologies

References:

14. Digital Image Processing  

CS-754


References:

15. Embedded Systems  

CS-722

Introduction: Embedded system, software embedded in system, embedded system on chip in VLSI circuit, Categories and requirements of embedded systems, Challenges and issues related to embedded software developments, Embedded system Design: Concepts of concurrency, processes, threads, mutual exclusion and inter-process communication, Models and languages for embedded software, Synchronous approach to embedded system design, Scheduling paradigms, Scheduling, Algorithms, Hardware/Software Co-design, Introduction to RTOS: Basic Design using RTOS, Interfacing, RISC Processor: Architecture, Memory, Reset and Interrupt, Functions, Parallel I/O ports, Timers/Counters, Serial Communication, Analog Interfaces

Case Studies and Applications of embedded systems

References:
1. Raj Kamal, Embedded Systems, TMH


Introduction to Geo informatics – Remote Sensing and Geospatial data, GIS; Physics of Remote Sensing, Sensors (Passive, active) and Satellites, Photogrammetry; Geospatial Data models (data structures), Digital Image Processing techniques in Remote Sensing; Geospatial data Processing, Spatial statistics, Spatial/temporal analysis and data mining: feature extraction, Supervised-Semisupervised-unsupervised classification; Applications of Geospatial informatics.

References:
4. H.J. Miller and Jiawei Han, Geographic Data Mining and Knowledge Discovery, 2nd Edition, CRC Press, 2009

17. Graph Theory CS-756

Introduction to Graph Theory, Euler Graphs, Operation On Graphs, Hamiltonian Paths And Circuits, Trees And Its Properties, Spanning Trees, Fundamental Circuits and Cut Sets, Connectivity And Separability, Planar Graphs, Kurtofski's Graphs, Geometric Dual, Directed Graphs, Euler Diagraphs, Graph Representation, Matrix and Vector Spaces, Coloring, Covering and Partitioning

References:
1. Narsingh Deo, Graph Theory and its application to Science and Engineering, PHI
2. Chartrand G., Zhang Ping, Introduction to Graph Theory, Tata McGraw-Hill
3. Douglas B. West, Introduction to Graph Theory 2nd Ed., Pearson Education
4. Graph Theory, Schaum’s Series

18. Large Scale Graph Algorithms and Application CS-777

Introduction and Application of Large-scale Graph, Characteristics, Complex Data Sources - Social Networks, Simulations, Bioinformatics; Categories- Social, Endorsement, Location, Co-occurrence graphs; Basic and Advanced Large-scale Graph Analysis- List Ranking, Link Analysis, Page Ranking Algorithms; Distributed Computation for Massive Data Sets- Spectral, Modularity-based Clustering, Random Walks; Large Graph Representation and Implementation- V-Graph Representation, MapReduce, Surfer, GraphLab; Advanced Topics- Power Law Distribution, Game-Theoretic Approach, Rank Aggregation and Voting Theory, Recommendation Systems, Social network analysis: case study -Facebook, LinkedIn, Google+, and Twitter
References:

1. Social and Economic Networks by Matthew O. Jackson (Nov 21, 2010)
2. Stanley Wasserman, Katherine Faust "Social Network Analysis Methods and Applications" (Structural Analysis in the Social Sciences) 1995
3. Tanja Falkowski "Community Analysis in Dynamic Social Networks" 2009

19. Machine Learning CS-714

Overview of machine learning; Concept learning and the general-to-specific ordering; Decision tree learning; Neural networks; Support vector machines(SVM); Evaluating hypothesis; Bayesian learning; Computational learning theory; Instance based learning; Genetic Based Machine Learning (GBML); Learning Classifier System (LCS); Genetic Programming; Learning set of rules; Analytical learning; Combining inductive and Analytical learning; Reinforcement learning; Unsupervised learning.

References:


20. Maximum Entropy Modeling and Application CS-757


References:


21. Micro Fabrication Technologies CS-758

Overview: VLSI and Micro-electromechanical Technologies, semiconductor and non-semiconductor materials and properties, Micromachining: Surface micromachining, bulk micromachining, Wafer Level Processes: Substrate, wafer cleaning, oxidation, Semiconductor doping: thermal diffusion and ion implantation, thin film deposition, wafer bonding, Lithography: Mask making, optical Lithography, LIGA and UV LIGA, Etching: Wet Processing, dry etching, Plasma Etching, Case studies: VLSI and MEMS technology, Lab: Minor project

References:

22. Mobile Ad Hoc Networks CS-720


References:

23. Modeling and Simulation CS-778

Introduction to Simulation, Types of Systems/Model, Distributed Lag Model, Random Numbers, Pseudo Random Number Generation, Random Quadrature, Antithetic variates, Important Sampling , Generating Non-Uniform Random Numbers, Inverse Transform Method, Acceptance-Rejection Techniques, Generating Discrete Random Variables, Poisson-Binomial Variates, Normal Variates-Polar Method, Monte-Carlo Methods, Markov Chain Monte Carlo, Metropolis Hastings Algorithm, Rare Event Simulation, Discrete Event Simulation, Queuing Models- M/M/1, M/M/1/N, M/M/m/m, M/M/m systems, Long-Run Measures of Performance,

References:

24. Multicast Communication CS-759

Introduction, Application, Characteristics, Multicast Backbone Architecture, Multicast Routing, Basic Routing Algorithm, Group Dynamics, Multicast routing between domains, Ip multicast, Multicast in transport protocols, address allocation, Multicast LANs, Reliable Multicast, Congestion control, Security issues.

References:

25. Natural Language Processing CS-760


References:
3. Harris M.D. Natural Language Processing, Benjamin/Cumming, 1991
26. Operating System  
CS-704

Introduction to Operating Systems; layered architecture, basic concepts: interrupt architecture, system calls., Processes and Threads: synchronization and protection; CPU scheduling; Deadlocks; Main memory management including paging and segmentation schemes; Virtual memory management including page replacement algorithms; Storage management including file systems; Protection; Security; Distributed operating systems; Real-Time operating systems; Case study of Linux.

References:

27. Network Security  
CS-761

Introduction, Security goals, attacks, services and mechanisms, cryptography and steganography, Symmetric Key cipher-substitution ciphers, Transposition ciphers, stream and block ciphers, Modern block ciphers, Modern stream ciphers, DES and AES, Elliptic curve cryptosystems, RSA, Message integrity, Digital signature, Public key distribution, IPSec, SET, ESP, PGP, SSL, Security in wireless.

References:

28. Object Oriented Programming  
CS-735

Concept of Object-Oriented Programming paradigm: Abstraction, Encapsulation, Inheritance, Polymorphism, Classes, Objects, member function, static member function, Data types, Arrays, Memory Allocation for Objects, Storage Management, constructors, destructor, Inheritance: single and multiple inheritances, operator overloading, function overloading, Polymorphism, abstract class, overriding, memory layout of objects; Exception Handling, Template class and function, Multithreaded programming.

References:
2. Lipman, S. B. C++ Primer, 3rd ed. Pearson Education
29. Object Oriented Software Engineering CS-707

Object Oriented Concepts; Modeling with UML; Analysis - Object Model, Dynamic Model; System Design - Addressing Design Goals; Object Design; Reusability - Introduction to Design Patterns; Mapping Models to Code; Testing Techniques - Unit, Integration and System Testing

References:

30. Parallel and Distributed Systems CS-762

Parallel processing concept, Parallelism in conventional machine, Pipelining, Flynn’s classification, Feng’s classification, Array processor, Amdahl’s law, Minsky’s conjecture. Static and dynamic networks, Single stage and multistage interconnection network, Blocking and nonblocking network, Star, Ring, Mesh, Torus, Pyramid etc. topology, Elementary permutations used in Interconnection network, Crossbar, Clos, Benes network, Shuffle exchange, Hypercube, PM21 network. Simple addition on various network topologies, Recurrence computation, Matrix multiplication, Sorting networks0-1 Principle, Bitonic sorter, Merger, Sorter PRAM Model, EREW, ERCW, CREW, CRCW algorithms. Distributed computation, characteristics of distributed systems, overview of related networking, operating systems and programming language concepts. Interprocess communication, message passing communication, remote procedure call (RPC), atomic transactions. Distributed coordination, physical and logical clocks, synchronization, mutual exclusion, leader election

References:
1. Kai Hwang , Advanced Computer Architecture, TMH
2. M.R. Bhujade ,Parallel Computing, New Age International Publications
3. Tanenbaum , Distributed System, Pearson Education
4. Nancy A. bynch, Distributed Algorithms:

31. Pattern Classification CS-763

References:
3. C M Bishop, Pattern Recognition and Machine Learning, Springer
4. D Koller, N Friedman, Probabilistic Graphical Models, MIT Press

32. Performance Modeling of Computer Communication Networks CS-764

Role of Modeling and Analysis, Examples of Performance Modeling, Analytic Models, Elements of Stochastic process, Poisson Process, Basic Queuing models, M/M/1; M/M/∞; M/G/∞; M/M/m; M/M/m/m Queues with Product formula. Cell and Burst scale Traffic Models: Round trip time distribution, PING data, Markov modulated Poisson Process, Long Range Dependence, Heavy Tail Distribution. Traffic Control: Admission Control, Effective Bandwidth, Statistical Multiplexing gain, Access Control: Leaky bucket System. Multi access Modelling: Slotted ALOHA Markov chain, Diffusion Approximation Approach, CSMA, Congestion Control, Window Control, Modelling TCP, Window Size, TCP Window Dynamics.

References:
2. I. Kaj, 2002, Stochastic Modeling in Broadband Communications Systems, SIAM.

33. Randomized and Approximation Algorithms CS-779

Probabilistic Recurrence, Basic Power and Efficiency of Randomization and Approximation, Computation Model and Complexity Classes, Reducibility, Classification of randomized algorithms: Las Vegas and Monte Carlo, Minimum cut algorithm, Bin-Balls Problem, Birthday-Paradox, Coupon-Collector, Stable Marriage Problem, Game Theory, Random variables and Basic inequalities (Markov, Chebyshev), Chernoff Bounds, Martingale Bound, Max-cut, Random Graphs, Markov chains and random walks, Random graph models for real-world networks, social networks, etc. Algorithms for 2-SAT and 3-SAT, Randomized search algorithm Introduction to approximation, Cardinality Vertex Cover, etc. Combinatorial Algorithms, Set Cover, Steiner Tree, Steiner Forest, TSP, Multiway Cut and k-Cut, Edge Cover and Vertex Cover, Layering applied to feedback vertex set, Independent Set problem, Min-cut Max Flow, Knapsack, Pseudo-polynomial time algorithm for knapsack, FPTAS, Bin Packing, Euclidean TSP, etc. LP Duality Theorem, Set Cover with Primal-Dual, Steiner Network, Sparsest Cut, Hardness of Approximation: PCP Theorem, Hardness of Clique, Set Cover, Shortest Vector
(Euclid and Gauss Theorems), Gram–Schmidt Orthogonalization, Approximate Counting, Problems with Markov chain Monte Carlo method.

References:

34. Swarm Intelligence CS-766


References:
2. Kennedy, J. and Eberhart, R.C., Swarm Intelligence, Morgan Kaufmann Publishers, 2001
5. Parsopoulos, K.E., Vrahatis, M.N., Particle Swarm Optimization and Intelligence: Advances and Applications, Information Science Reference, IGI Global, 2010
6. Clerc, M., Particle Swarm Optimization, ISTE, 2006

35. Service Oriented Architecture CS-738

SOA Fundamentals - definition, characteristics; Architecture; Evolution; Web Service; Web Service Composition - Orchestration and Choreography; Interoperability; WS*, Metadata; Security; XML Technology - name-spaces, schema, well-formed XML documents; WSDL - name spaces, Abstract and Concrete Models; Universal Description, Discovery and Integration (UDDI), SOAP (messaging framework); Composition Languages - BPEL and CDL
36. Software Engineering   CS-731


References:
4. Gamma Erich, Helm Richard, Johnson Ralph, Vlisside John, Design Patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley Professional.
5. Freeman Elisabeth, Freeman Eric, Bates Bert, Sierra Kathy, Robson Elisabeth, Head First Design Patterns, O’Reilly Media.

37. Software Quality Assurance   CS-767

References:

38. Theory of Computation  CS-780


References:

39. Topics in Mathematical Sciences  CS-736


References:

40. Vehicular Communication Networks  CS-768


References:

41. VLSI Design and Testing  CS-769

Introduction to VLSI Design, Different types of VLSI design styles: Full custom, standard cell based, gate array based, programmable logic, field programmable gate arrays etc. VLSI Design flow. CMOS logic: operation of MOS transistors as a switch, MOS inverter, stick diagram, design rules and layout, delay analysis, different type of MOS circuits: Dynamic logic, pass transistors etc. Combinational logic cells, Sequential logic cells, Datapath logic cells, I/O cells. ASIC Library Design: Transistors as Resistors and parasitic Capacitance, Logical effort, gate array, standard cell and datapath cell design. Introduction to hardware description language (HDL) Verilog. Floor-planning and Placement: I/O and power planning, clock planning. Routing global and detailed. VLSI Testing- Fault Modeling, Test pattern generation for combinational circuits, Sequential circuits testing, Built-in self-test.

References:
42. Web Mining  CS-737


References:
1. Bing Liu, Web Data Mining, Springer Publication
2. Somen Chakrabarti, Web mining, Elsevier Publication
4. Witton Frank, Data Mining, Morgan Kauffan Publishers

43. Wireless Communication and Mobile Computing  CS-718


References:
2. Matthew s. Gast, 802.11 wireless networks, o’reilly
4. Jochen Schiller , Mobile communications, phi/person edu., 2nd ed.,

44. Wireless Sensor Networks  CS-770

Data fusion technique, Load/energy balancing and lifetime maximization algorithms and simulation. Simulation using ns-2, Qualnet and MATLAB.

References:

45. MEMS Technology CS-781

Overview: VLSI and Micro-electromechanical Technologies, materials for MEMS. Actuation techniques: Electrostatic, Electromagnetic, Thermal, Piezoelectric, Micromachining: Surface micromachining, bulk micromachining, LIGA, Non-Silicon micromachining techniques: PCB, LCP, PDMS/SU8, Case studies: MEMS/RF MEMS/BioMEMS

Reference Books:

46. VLSI Technology CS-726


Reference Books:
2. S. M. Sze, VLSI Technology, Mcgraw –Hill,1983