M.Tech Computer Science & Technology
Course Structure and Scheme of Valuation w.e.f. 2013-14
I SEMESTER

Code	Name of the subject	Periods/week Theory	Lab	Max. Marks Ext.	Int.	Total	Credits
MTCST1.1	Mathematical Foundations of Computer Science	3	-	70	30	100	4
MTCST1.2	Data Structures & Algorithms	3	-	70	30	100	4
MTCST1.3	Data Base Management Systems	3	-	70	30	100	4
MTCST1.4	Computer Organization & Architecture	3	-	70	30	100	4
MTCST1.5	Advanced Operating Systems	3	-	70	30	100	4
MTCST1.6	Computer Networks	3	-	70	30	100	4
MTCST1.7	Data Structures & Programming Lab	-	3	50	50	100	2
MTCST1.8	Database Management Systems Lab	-	3	50	50	100	2
	Total	18	6	520`	280	800	28

II SEMESTER

Code	Name of the subject	Periods/week Theory	Lab	Max. Marks Ext.	Int.	Total	Credits
MTCST2.1	Artificial Intelligence	3	-	70	30	100	4
MTCST2.2	Object Oriented Software Engineering	3	-	70	30	100	4
MTCST2.3	Compiler Design	3	-	70	30	100	4
MTCST2.4	Data ware Housing &Data Mining	3	-	70	30	100	4
MTCST2.5	Elective I	3	-	70	30	100	4
MTCST2.6	Elective II	3	-	70	30	100	4
MTCST2.7	Network Programming & Web Programming Lab	-	3	50	50	100	2
MTCST2.8	OOSE Lab	-	3	50	50	100	2
	Total	18	6	520`	280	800	28

Elective I: Parallel Programming/Image Processing/Semantic Web/Embedded Systems/ Computer Vision/ Computer Graphics &Visual Computing /Big Data Analysis

Elective II: Cloud Computing/ Mobile Computing/Soft Computing/ Grid Computing/Cluster Computing/ Pervasive Computing

M.Tech Information Technology
Course Structure and Scheme of Valuation w.e.f. 2013-14
I SEMESTER

Code	Name of the subject	Periods/week Theory	Lab	Max. Marks Ext.	Int.	Total	Credits
MTIT1.1	Mathematical Foundations of Computer Science	3	-	70	30	100	4
MTIT1.2	Data Structures & Algorithms	3	-	70	30	100	4
MTIT1.3	Data Base Management Systems	3	-	70	30	100	4
MTIT1.4	Computer Organization & Architecture	3	-	70	30	100	4
MTIT1.5	Advanced Operating Systems	3	-	70	30	100	4
MTIT1.6	Computer Networks	3	-	70	30	100	4
MTIT1.7	Data Structures & Programming Lab	-	3	50	50	100	2
MTIT1.8	Database Management Systems Lab	-	3	50	50	100	2
	Total	**18**	**6**	**520`**	**280**	**800**	**28**

II SEMESTER

Code	Name of the subject	Periods/week Theory	Lab	Max. Marks Ext.	Int.	Total	Credits
MTIT2.1	Web Systems & Technologies	3	-	70	30	100	4
MTIT2.2	Object Oriented Software Engineering	3	-	70	30	100	4
MTIT2.3	Information Security & Cryptography	3	-	70	30	100	4
MTIT2.4	Wireless & Mobile Networks	3	-	70	30	100	4
MTIT2.5	Elective I	3	-	70	30	100	4
MTIT2.6	Elective II	3	-	-	100	100	4
MTIT2.7	Network Programming & Web Programming Lab		3	50	30	100	2
MTIT2.8	OOSE Lab		3	50	30	100	2
	Total	**18**	**6**	**520`**	**280**	**800**	**28**

Elective I: Social & Media Analysis/ E-Commerce/ Mathematics Of Internet Systems & Control/IT Infrastructure Planning Management/ Geo-informatics/ Data Base Security/Business Intelligence/Big Data analysis

Elective II: Cloud Computing/ Mobile Computing/Soft Computing/ Grid Computing/Cluster Computing/ Pervasive Computing

M. Tech Computer Science & Technology with a Specialization in Artificial Intelligence & Robotics

Course Structure and Scheme of Valuation w.e.f. 2013-14

I SEMESTER

Code	Name of the subject	Periods/week Theory	Lab	Max. Marks Ext.	Int.	Total	Credits
MTCSTAIR1.1	Mathematical Foundations of Computer Science	3	-	70	30	100	4
MTCSTAIR1.2	Data Structures & Algorithms	3	-	70	30	100	4
MTCSTAIR1.3	Data Base Management Systems	3	-	70	30	100	4
MTCSTAIR1.4	Computer Organization & Architecture	3	-	70	30	100	4
MTCSTAIR1.5	Advanced Operating Systems	3	-	70	30	100	4
MTCSTAIR1.6	Introduction to Robotics	3	-	70	30	100	4
MTCSTAIR1.7	Data Structures & Programming Lab	-	3	50	50	100	2
MTCSTAIR1.8	Robotics Lab	-	3	50	50	100	2
	Total	**18**	**6**	**520`**	**280**	**800**	**28**

II SEMESTER

Code	Name of the subject	Periods/week Theory	Lab	Max. Marks Ext.	Int.	Total	Credits
MTCSTAIR2.1	Artificial Intelligence	3	-	70	30	100	4
MTCSTAIR2.2	Neural Networks & Fuzzy Systems		3	-	70	30	100	4
MTCSTAIR2.3	Expert Systems	3	-	70	30	100	4
MTCSTAIR2.4	Data ware Housing &Data Mining		3	-	70	30	100	4
MTCSTAIR2.5	Advanced Robotics		3	-	70	30	100	4
MTCSTAIR2.6	Elective	3	-	70	30	100	4
MTCSTAIR2.7	AI & Expert Systems Lab	-	3	50	50	100	2
MTCSTAIR2.8	Data Mining Lab	-	3	50	50	100	2
	Total	**18**	**6**	**520`**	**280**	**800**	**28**

Elective I: Pattern Recognition/Image Processing/Semantic Web/ Computer Vision /Big Data Analysis

M.Tech Computer Science & Technology with a Specialization in Bioinformatics

Course Structure and Scheme of Valuation w. e. f. 2013-14
I SEMESTER

Code	Name of the Subject	Periods/week Theory	Lab	Max. Marks Ext.	Int.	Total	Credits
MTCSTBI1.1	Mathematical Foundations of Computer Science	3	-	70	30	100	4
MTCSTBI1.2	Data Structures & Algorithms	3	-	70	30	100	4
MTCSTBI1.3	Data Base Management Systems	3	-	70	30	100	4
MTCSTBI1.4	Computer Organization & Architecture	3	-	70	30	100	4
MTCSTBI1.5	Advanced Operating Systems	3	-	70	30	100	4
MTCSTBI1.6	Fundamentals of Bioinformatics	3	-	70	30	100	4
MTCSTBI1.7	Data Structures & Programming Lab	-	3	50	50	100	2
MTCSTBI1.8	Bioinformatics Lab	-	3	50	50	100	2
	Total	**18**	**6**	**520`**	**280**	**800**	**28**

II SEMESTER

Code	Name of the Subject	Periods/week Theory	Lab	Max. Marks Ext.	Int.	Total	Credits
MTCST2.1	Artificial Intelligence	3	-	70	30	100	4
MTCST2.2	Bioinformatics Algorithms	3	-	70	30	100	4
MTCST2.3	Data Mining For Bioinformatics	3	-	70	30	100	4
MTCST2.4	Techniques for Bioinformatics	3	-	70	30	100	4
MTCST2.5	Genetic Algorithms	3	-	70	30	100	4
MTCST2.6	Elective	3	-	70	30	100	4
MTCST2.7	Computational Biology Lab	-	3	50	50	100	2
MTCST2.8	Perl Programming Lab	-	3	50	50	100	2
	Total	**18**	**6**	**520`**	**280**	**800**	**28**

Elective : Geno-Informatics/Semantic Web/Fuzzy Systems/ Modeling of Protein Structures /Big Data Analysis

M.Tech Computer Science & Technology with a Specialization in Computer Networks

Course Structure and Scheme of Valuation w.e.f. 2013-14

I SEMESTER

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTCSTCN1.1	Mathematical Foundations of Computer Science	3	-	70	30	100	4
MTCSTCN1.2	Data Structures & Algorithms	3	-	70	30	100	4
MTCSTCN1.3	Data Base Management Systems	3	-	70	30	100	4
MTCSTCN1.4	Computer Organization & Architecture	3	-	70	30	100	4
MTCSTCN1.5	Advanced Operating Systems	3	-	70	30	100	4
MTCSTCN1.6	Computer Networks	3	-	70	30	100	4
MTCSTCN1.7	Data Structures & Programming Lab	-	3	50	50	100	2
MTCSTCN1.8	Computer Networks Lab	-	3	50	50	100	2
	Total	**18**	**6**	**520`**	**280**	**800**	**28**

II SEMESTER

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTCSTCN2.1	Internet Technologies	3	-	70	30	100	4
MTCSCNT2.2	Network Technologies	3	-	70	30	100	4
MTCSTCN2.3	Sensor Networks	3	-	70	30	100	4
MTCSTCN2.4	Wireless Networks	3	-	70	30	100	4
MTCSTCN2.5	TCP/IP	3	-	70	30	100	4
MTCSTCN2.6	Elective	3	-	70	30	100	4
MTCSTCN2.7	Wireless Networks Lab	-	3	50	50	100	2
MTCSTCN2.8	Protocol Development Lab	-	3	50	50	100	2
	Total	**18**	**6**	**520`**	**280**	**800**	**28**

Elective: Multi Media Networks/Network Management Systems/Performance Analysis of Network Architecture/

M. Tech (CST, IT, CSTAIR, CSTBI, CST CN)

III SEMESTER

| Code | Name of the subject | Periods/week | | Max. Marks | | Total | Credits |
		Theory	Lab	Ext.	Int.		
MTCST 3.1	Seminar	-	-	-	100	100	2
MTCST3.2	Thesis Work Part 1				Grade	Grade	10
	Total						**12**

1. Candidates can do their thesis work within the department or in any industry/research organization for two semesters (i.e. 3rd and 4th semesters). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor(CO-Guide) should be from the industry/research organization.
2. Thesis part I should be submitted at the end of 3rd semester and it will be evaluated by a committee consisting of Chairman Board of Studies, Head of the Department and thesis guide.
3. The candidate should give one seminar in III semester on his research work/advanced topics in the related fields. Seminar marks & credits are evaluated internally by the guide and added to the CGPA.
4. Although credits are allotted for the thesis work they will not be taken for the calculation of CGPA.

IV SEMESTER

| Code | Name of the subject | Periods/week | | Max. Marks | | Total | Credits |
		Theory	Lab	Ext.	Int.		
MTCST 3.1	Seminar	-	-	-	100	100	2
MTCST3.2	Thesis Work Part 2			Grade		Grade	15
	Total						**17**

1. The candidate should give one seminar in the IV Semester on his research before submission of the thesis. Seminar marks & credits are evaluated internally by the guide and added to the CGPA.
2. A publication of a paper on the thesis work in a National/International Conference proceedings with presentation certificate or a paper on the thesis work be communicated to a National/International Journal & accepted for publication for the submission of thesis at the end of 4th semester is mandatory.
3. Final Thesis with Part I & Part II should be submitted at the end of 4th semester and it will be evaluated by a committee consisting of Chairman Board of Studies, Head of the Department , External Examiner and thesis guide.
4. The candidate has to defend his thesis in a Viva-voce examination to be conducted by the above committee. The committee should submit a report, with signatures of all the members, candidate wise, with grade A-Excellent/ Grade B-Good/Grade C- fair/ Grade D- Reappear.
5. The external examiner shall be nominated by the Hon'ble Vice Chancellor as per the norms of the University.
6. Although credits are allotted for the thesis work they will not be taken for the calculation of CGPA.

Detailed Syllabus for M.Tech First Semester

MTCST 1.1   MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Common with M. Tech (CST, IT, CSTAIR, CSTBI, CSTCN)

Instruction: 3 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

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1. Mathematical notions of sets, sequences and tuples, functions and relations, Primitive recursive functions, computable functions, examples, graphs, strings and languages,

2.   Boolean logic – properties and representation, theorems and types of proofs, deductive, inductive, by construction, contradiction and counter-examples.

3. Introduction to Number theory, Divisibility, modular arithmetic (addition modulo and multiplication modulo); Statements and applications of Euler and Fermat Theorems, Primitive Roots, Discrete Logarithms, Primality Test, Finding Large primes, Definition of Elliptic Curves and their applications to Cryptography.

4. Introduction To Finite Automata: Alphabets and languages- Deterministic Finite Automata – Non- deterministic Finite Automata – Equivalence of Deterministic and Non-Finite Automata – Languages Accepted by Finite Automata – Finite Automata and Regular Expressions – Properties of Regular sets &Regular Languages and their applications.

5. 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 – pushdown automata and Equivalence with Context Free Grammars.

6. Turing Machines: The Definition of Turing Machine – Computing with Turing Machines – Combining Turing Machines, , programming techniques for Turing Machines,

7. Variants of Turing Machines, Restricted Turing Machines Universal Turing Machines. The Halting Problem, Decidable & undecidable problems- Post Correspondence Problems

Text books:

1. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman , Pearson Education Asia.
2.Cryptography and Network Security, William Stallings.(Second Edition)Pearson Education Asia.

Reference books:

1. Introduction to languages and theory of computation – John C. Martin (MGH)
2. Discrete Mathematical structures with application to Computer Science – J.P. Tremblay and R. Manohar
3. Introduction to Theory of Computation – Michael Sipser (Thomson Nrools/Cole)
4. Cryptanalysis of number theoretic Cyphers, Samuel S. Wagstaff Jr.Champan & Hall/CRC Press 2003.
5. Network Security: The Complete Reference by Roberta Bragg, Mark Phodes –Ousley, Keith Strassberg Tata McGraw-Hill.

MTCST 1.2 **DATA STRUCTURES AND ALGORITHMS**
Common with M.Tech(CST, IT, CSTAIR, CSTBI, CSTCN)

Instruction: 3 Periods/week **Time: 3 Hours** **Credits: 4**

Internal: 30 Marks **External: 70 Marks** **Total: 100 Marks**

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1. INTRODUCTION:
Overview of C++ classes, pointers, parameters passing, templates, using Matrices.

2. ALGORITHM ANALYSIS:
Basics of time complexity estimates, General norms for running time calculation

3. LISTS, STACKS & QUEUES:
Abstract Data Types, Representation & implementation of ADT list, Doubly linked list, Circular linked lists, Representation, Implementation and applications of ADT stack and Queue.

4. TREES:
Implementation and traversal of trees, Binary Trees and Binary search trees in C++, Concepts of AVL Trees, Splay Trees and B-Trees.

5. HASHING:
Hash Function, Separate chains, Open addressing, rehashing, Extendible Hashing.

6. INTERNAL SORTING ALGORITHMS:
Sorting like insertion Sort, shell Sort, Heap Sort, Merge Sort, Quick Sort and Simple external Sorting algorithm.

7. DISJOINT SET:
Equivalence Relations, Find and Union algorithms an dynamic sets, Path compression and Union-by-Rank algorithm analysis.

8. GRAPH ALGORITHMS:
Representation of graph Topological Sort, shortest-path Algorithm, Network flow problem, Minimum spanning tree algorithm, Applications of Depth – First search, Introduction to NP-Completeness.

TEXT BOOK:

Data Structures & Algorithm Analysis in C++ , Mark Allen Weiss. Second edition, Pearson Edition. Asia.

REFERENCE BOOKS:

1. Data Structures & Algorithm in C++, Adam Drozdek. Vikas publication House.

2. Data Structure, Algorithm and OOP, Gregory L. Heileman (Tata Mc Graw Hill Edition).

3. Data Structures, Algorithms and Applications in C++,Sartaj Sahni,Mc Graw-Hill International Edition.

MTCST 1.3 **DATA BASE MANAGEMENT SYSTEMS**
Common with M.Tech (CST, IT, CSTAIR, CSTBI, CST CN)

Instruction:3 Periods/week	**Credits:4**	**Time: 3 Hours**
Internal: 30 Marks	**External: 70 M arks**	**Total: 100 Marks**

1.   **D**
   atabase Systems: Introduction to the Database Systems, Concepts of Relational Models and Relational Algebra. SQL: Introduction to SQL Queries, Integrity Constraints, Joins, Views, Intermediate and Advanced SQL features and Triggers.

2.   **D**
   atabase Design: Overview of the Design process, E-R Models, Functional dependencies and other kinds of dependencies, Normal forms, Normalization and Schema Refinement.

3.   **D**
   atabase Application Design and Development: User Interfaces and Tools, Embedded SQL, Dynamic SQL, Cursors and Stored procedures, JDBC, Security and Authorization in SQL, Internet Applications.

4.
   Query Evaluation: Overview, Query processing, Query optimization, Performance Tuning.

5.
   Database System Architectures: Centralized and Client-Server Architecture, Server system Architecture, Parallel and Distributed database, Object based databases and XML. Advanced data types in databases. Cloud based data storage systems.

6.   **T**
   ransaction Management: Overview of Transaction Management, Transactions, Concurrency control, Recovery systems, Advanced Transaction Processing.

7.   **C**
   ase Studies: Postgre SQL, Oracle, IBM DB2 Universal Database, Microsoft SQL Server.

Text Books:
1. Database System Concepts, Avi Silberschatz , Henry F. Korth , S. Sudarshan McGraw-Hill, Sixth Edition, ISBN 0-07-352332-1.

References:
1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke,McGraw-Hill.

MTCST 1.4   COMPUTER ORGANIZATION AND ARCHITECTURE

Common with M.Tech (CST, IT, CSTAIR, CSTBI, CSTCN)

Instruction: 3 Periods/week   **Time: 3 Hours**   **Credits: 4**

Internal: 30 Marks   **External: 70 Marks**   **Total: 100 Marks**

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1. Register Transfer and Micro operations:
Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

2. Basic Computer Organization and Design:
Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

3. Micro programmed Control:
Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

4. Central Processing Unit:
Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC)

5. Input/output Organization:
Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

6. Memory Organization:
Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

7. Overview of Computer Architecture:
Evolution of Computer Systems, Parallelism in Uni- processor System, Parallel Computer Structures, Architectural Classification Schemes, Parallel Processing Applications.

 Text Book:

1). Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept. 2008 .
2) Computer Architecture and Parallel Processing, Kai Hwang and Faye A. Briggs, McGraw Hill, International Edition1985.

Reference Book:

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.
2. "Computer System Architecture", John. P. Hayes.
3. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier).

MTCST 1.5   **ADVANCED OPERATING SYSTEMS**
Common with M.Tech (CST, IT, CSTAIR, CSTBI, CSTCN)

Instruction: 3 Periods/week   **Time: 3 Hours**   **Credits: 4**

Internal: 30 Marks   **External: 70 Marks**   **Total: 100 Marks**

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1. Introduction To Operating Systems, Types Of Operating Systems, Operating System Structures. Operating-System Services, System Calls, Virtual Machines, Operating System Design And Implementation.

2. **Process Management**: Process Concepts, Operations On Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple -Processor Scheduling. Thread Scheduling.

3. **Process Synchronization & Deadlocks**: The Critical Section Problem, Semaphores, And Classical Problems Of Synchronization, Critical Regions, Monitors, Deadlocks,-System Model, Deadlocks Characterization, Methods For Handling Deadlocks, Deadlock- Prevention, Avoidance, Detection,& Recovery from Deadlocks.

4. **Memory Management & File System Implementation:** Logical Versus Physical Address Space, Paging And Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing, File System Implementation -Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers

5. **Distributed Operating Systems:** Distributed System Goals**,** Types Of Distributed Systems, Styles & Architecture Of Distributed Systems, Threads, Virtualization, Clients, Servers, Code Migration, and Communication in Distributed Systems.

6. **Distributed Systems & Synchronization:** Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Data-Centric Consistency Models, Client-Centric Consistency Models, Consistency Protocols.

7. **Fault Tolerance, Security:** Introduction To Fault Tolerance, Process Resilience,, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery, Secure Channels, Access Control, Security Management

8. **Case Study:** Over View Of UNIX, LINUX, Windows NT , Android And IOS Operating systems

Text Books:

1) Silberschatz & Galvin, 'Operating System Concepts', Wiley.

2) "DISTRIBUTED SYSTEMS", Second edition, Andrew S.Tanenbaum, Maarten Van teen.

References:

1) William Stallings-"Operating Systems"- 5th Edition - PHI
2) Charles Crowley, 'Operating Systems: A Design-Oriented Approach', Tata Hill Co.,1998 edition.
3) Andrew S.Tanenbaum, 'Modern Operating Systems', 2nd edition, 1995, PHI.
4) Advanced Concepts in Operating systems.Distributed, Database and Multiprocessor operating systems, Mukesh singhal, Niranjan G.Shivaratri, Tata McGraw Hill Edition.
5) Dhamdhere, "Operating Systems - A concept based approach", 2nd Edition, TMH, 2006.
6) Daniel P Bovet and Marco Cesati, "Understanding the Linux Kernel ", 3rd Edition,' Reilly, 2005.
7) Pradeep K. Sinha, "Distributed Operating Systems - Concepts and Design", 2nd Edition, IEEE 1997.

MTCST1.6   **COMPUTER NETWORKS**
                   Common with M.Tech (CST, IT, CSTCN)

Instruction: 3 Periods/week   **Time: 3 Hours**   **Credits: 4**

Internal: 30 Marks   **External: 70 Marks**   **Total: 100 Marks**

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1. **Introduction to Computer Networks:** Introduction, Network Hardware, Network Software, Reference Models, Data Communication Services & Network Examples, Internet Based Applications.

2. **Data Communications:** Transmission Media, Wireless Transmission, Multiplexing, Switching, Transmission in ISDN, **Broad** Band ISDN , ATM Networks,

3. Data Link Control, Error Detection & Correction, Sliding Window Protocols, LANs & MANs: IEEE Standards for LANs & MANs-IEEE Standards 802.2, 802.3, 802.4, 802.5, 802.6, High Speed LANs.

4. **Design Issues in Networks:** Routing Algorithms, Congestion Control Algorithms, Net work Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

5. **Internet Transport Protocols:** TRANSPORT Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues.

6. Over View of DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols, World Wide Web, Firewalls.

7. **Network Devices:** Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Brouters, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.

8. **Advanced Concepts in Networks:** Over View of Cellular Networks, Adhoc Networks, Mobile Adhoc Networks, Sensor Networks, Virtual Private Networks .Delay Tolerant Networks DTN, Ipvs,.

Text Book:

1. Computer Networks, Andrews S Tanenbaum,, Edition 5, PHI, ISBN:-81-203-1165-5

References:

1. Data Communications and Networking , Behrouz A Forouzan , Tata McGraw-Hill Co Ltd , Second Edition, ISBN: 0-07-049935-7
2. Computer networks, Mayank Dave,   CENGAGE.
3. Computer networks, A system Approach, 5th ed, Larry L Peterson and Bruce S Davie, Elsevier.
4. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
5. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

MTCST 1.7　　　　　**DATA STRUCTURES& PROGRAMMING LAB**

Common with M.Tech (CST, IT, CSTAIR, CSTBI, CSTCN)

Instruction: 3 Periods/week　　　　**Time: 3 Hours**　　　　**Credits: 2**

Internal: 50 Marks　　　　**External: 50 Marks**　　　　**Total: 100 Marks**

Implementation of Data Structures and Algorithms using C.

1. To perform various operations such as insertion, deletion, display on single linked lists.

2. To implement
    (i) Stacks using linked list.   (ii) Queues using linked list.

3. To perform different types of searching techniques on a given list
    (i) Sequential search (ii) Transpose sequential search (iii) Binary search(iv) Fibonacci search

4. To perform different types of sortings on a given list
    (i) Bubble sort (ii) Insertion sort (iii) Selection sort(iv) Merge sort

5. To perform different types of sortings on a given list
    (i) Quick sort (ii) Shell sort (iii) Radix sort (iv) Topological sort

6. To perform the following
    (i) To convert the given infix expression to postfix expression
    .(ii) To evaluate the given postfix expression.

7. To perform various operations on graphs
    (i) Vertex insertion.
    ii) Vertex deletion.
    iii) Edge insertion.
    (iv)Edge deletion.
    (v) BFS.
    (vi) DFS.

8. To implement dictionaries using hashing technique

9. To perform various operations on binary heap.

10. To perform various operations on Binary search tree.

11. To perform operations on AVL trees.

12. To perform various operations on B-tree.

MTCST 1.8   **DATA BASE MANAGEMENT LAB**
Common with M.Tech (CST, IT, CSTAIR, CSTBI, CSTCN)

Instruction: 3 Periods/week	**Time: 3 Hours**	**Credits: 2**
Internal: 50 Marks	**External: 50marks**	**Total: 100Marks**

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1. **Accessing the Database**: The first laboratory exercise is to connect to a database, populate it with data, and run very simple SQL queries. (Data Definition, Table Creation, Constraints, Insert, Select Commands, Update & Delete Commands.)
2. **Basic SQL:** This lab covers simple SQL queries. (Inbuilt functions in RDBMS.)
3. **Intermediate SQL:** This lab covers more complex SQL queries. (Nested Queries & Join Queries, Control structures)
4. **Advanced SQL:** This lab covers even more complex SQL queries. (Procedures and Functions, .PL/SQL, Cursors and Triggers)
5. **Database Access from a Programming Language:** This lab introduces you to database access from a programming language such as Java or C#. Although phrased using Java/JDBC, the exercise can be done using other languages, OBDC or ADO.NET APIs.
6. **Building Web Applications:** This lab introduces you to construction of Web applications. Although phrased using the Java Servlet API, the exercise can be done using other languages such as C# or PHP.
7. **Project:** Each student is assigned with a problem. The student is to develop a logical and physical database design for the problem and develop Forms, Menu design and Reports.
   A. The logical design performs the following tasks:

   1. Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints.

   2. Identify the functional dependencies in each relation

   3. Normalize to the highest normal form possible

   B. Perform physical design based above logical design using Oracle/MSSQL on Windows platform and MySQL/PostgreSQL on Linux platform.

Sample Term Projects

1. Retailer database
2. Automobile sales database
3. Electronics vendor database
4. Package delivery database
5. Real estate database

References:

1) Database System Concepts, Avi Silberschatz , Henry F. Korth , S. Sudarshan ,McGraw-Hill, Sixth Edition, ISBN 0-07-352332-1.
2) ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
3) ORACLE Database Log PL/SQL Programming Scott Urman, TMG Hill.
4) SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.
5) Oracle PL/SQL Programming, Steven Feuerstein, O'Reilly Publishers.

MTCSTAIR1.6   **FUNDAMENTALS OF ROBOTICS**

Instruction: 3 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

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1. **Introduction to Robotics:**

   Classification, Components, Characteristics, Applications

2. **Robot Kinematics: Position Analysis-I**

   Robots as Mechanisms, Matrix Representation, Homogeneous Transformation Matrices, Representation of pure translation, Representation of pure rotation about an axis

3. **Robot Kinematics: Position Analysis-II**

   Representation of combined transformations, Transformations relative to the rotating, Inverse of Transformation Matrices, Forward and Inverse Kinematics of Robots

4. **Fundamentals of Actuating Systems:**

   Characteristics of Actuating Systems, Comparison of Actuating Systems, Hydraulic Devices, Pneumatic Devices, Magnetostrictive Actuating Systems

5. **Electric Actuators**

   Introduction to Electric Actuators, Electric Motors, Control of Electric Motors

6. **Sensors-I**

   Characteristics, Position Sensors, Velocity and Acceleration Sensors,

   Force and Pressure Sensors, Torque and Micro switches, Light and Infrared Sensors

7. **Sensors-II**

   Touch and Tactile Sensors, Proximity and Range finders, Sniff Sensors, Vision Systems, Voice Recognizers,Voice Synthesizer, Remote Center Compliance Device

Text Books:

1. Saeed B. Niku, Introduction to Robotics Analysis, Application, Pearson Education Asia, 2001.

Reference Books:

1. R.K.Mittal and I J Nagrath, Robotics and Control, TMH, 2003.

2. Computational Intelligence, Davis Poole, Alan Mackwath, Randy Coehel, Oxford University Press 1998.

MTCSTBI1.6   **FUNDAMENTALS OF BIOINFORMATICS**

Instruction: 3 Periods/week   **Time: 3 Hours**   **Credits: 4**
Internal: 30 Marks   **External: 70 Marks**   **Total: 100 Marks**
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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)

MTCSTAIR 1. 8   **ROBOTICS LAB**

Instruction: 3 Periods/week   **Time: 3 Hours**   **Credits: 2**
Internal: 50 Marks   **External: 50marks**   **Total: 100Marks**

      This Lab. Is intended to get familiarized with mechanical,electrical,and electronics structures of different types of robots for monitoring, controlling and developing applications like pick and place,swapping,e.t.c., by either stand alone controller in the robot structure or interfacing to PC.

1. Programming a simple Robot on Wheels.

2. Programming a Walking Robot.

3. Experiments based on Bipedal Robot.

4. Experiments based on Humanoid Robot-ROOBONOVA.

5. Pick and Place Application Programming with 4 DOF Robot Arm by Interfacing to PC.

6. Swap Application Programming with 4 DOF Robot Arm by Interfacing to PC.

7. Pick and Place Application Programming with 5 DOF Robot Arm by Interfacing to PC.

8. Swap Application Programming with 5 DOF Robot Arm by Interfacing to PC.

9. Pick and Place Application Programming with 6 DOF Robot Arm by Interfacing to PC.

10. Swap Application Programming with 6 DOF Robot Arm by Interfacing to PC.

REQUIRED MATERIALS

Mechanical Tools with Tool Box,, IBM Compatible PCs- 10 No,..

Interface Cables for Robot Structures.

Robot Platform.

Walking Robot structure with Controller.

BRAT Kit for Bipedal Robot.

Simple Humanoid Robot-ROBONOVA-I.

5 DOF Robot Arm with Accessories.

6 DOF Robot Arm with Accessories.

Purpose: This lab is expected to learn about various Bio-Informatics tools to implement various theoretical concepts related theory papers. They are expected to know about the different databases available and techniques like sequence alignment problems.

List of Experiments:

1. **Introduction about different biological databases**

   Protein and Gene Sequence Databases (NCBI,DDBJ, EMBL, SWISS PROT,PIR)

   Structure Databases (MMDB,PDB,FSSP,CATH,SCOP)

   Pathway Databases (KEGG,BRENDA,METACYC,ECOCYC)

   Bolographic Databases (PUBMED,MEDLINE)

2. **Sequence Retrieval From Biological Databases**

3. **Gene Prediction Methods**

4. **Analysis Of Protein Sequence Using Expasy**

5. **Sequence Similarity Searching Of Nucleotide Sequences**

6. **Sequence Similarity Searching Of Protein Sequences**

7. **Multiple Sequence Alignment**

8. **Dynamic Programming Method-Local Alignment**

9. **Dynamic Programming Method-Global Alignment**

   Reference Book

   Lab Manual

MTCST CN 1.8   **Computer Networks Lab**

Instruction: 3 Periods/week   **External Assessment: 100marks**

Internal Assessment: 50 Marks   **Time: 3 Hours**

a) Network Programming

1. Socket Programming

       a. TCP Sockets

       b. UDP Sockets

       c. Applications using Sockets

2. Simulation of Sliding Window Protocol

3. Simulation of Routing Protocols

4. RPC

5. Development of applications such as DNS/ HTTP/ E – mail/ Multi - user Chat

b)Web Programming

1. Design of the Web pages using various features of HTML and DHTML

2. Client server programming using servlets, ASP and JSP on the server side and java script

on the client side

3. Web enabling of databases

4. Multimedia effects on web pages design using Flash.

Reference Books:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill

2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education