

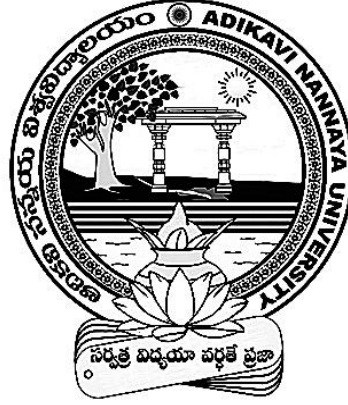
Course Structure and Syllabus

I MTech – I Semester

Computer Science and Technology

Computer Science and Technology with Big Data Analytics

(From the admitted batch of 2017 – 2018 under CBCS Scheme)



**University College of Engineering
Adikavi Nannaya University
Rajahmendravaram – 533 296**

Course Structure and Syllabus

I MTech CST I Semester

(From the admitted batch of 2017 – 2018 under CBCS Scheme)

| Sub Code | Subject | Hrs/Week | | Max Marks | | Total Marks | Credits |
|--------------|--|-----------|----------|------------|------------|-------------|-----------|
| | | Theory | Lab | Internal | External | | |
| MTCST101 | MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE | 4 | -- | 25 | 75 | 100 | 4 |
| MTCST102 | DATA STRUCTURES AND ALGORITHMS | 4 | -- | 25 | 75 | 100 | 4 |
| MTCST103 | DATABASE MANAGEMENT SYSTEMS | 4 | -- | 25 | 75 | 100 | 4 |
| MTCST104 | COMPUTER ORGANIZATION AND ARCHITECTURE | 4 | -- | 25 | 75 | 100 | 4 |
| MTCST105 | ADVANCED OPERATING SYSTEMS | 4 | -- | 25 | 75 | 100 | 4 |
| MTCST106 | COMPUTER NETWORKS | 4 | -- | 25 | 75 | 100 | 4 |
| MTCST107 | DATA STRUCTURES LAB | - | 3 | 50 | 50 | 100 | 2 |
| MTCST108 | DBMS LAB | -- | 3 | 50 | 50 | 100 | 2 |
| TOTAL | | 24 | 6 | 250 | 550 | 800 | 28 |

I MTech CST with Big Data Analytics I Semester

| Sub Code | Subject | Hrs/Week | | Max Marks | | Total Marks | Credits |
|--------------|--|-----------|----------|------------|------------|-------------|-----------|
| | | Theory | Lab | Internal | External | | |
| MTBDA101 | MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE | 4 | -- | 25 | 75 | 100 | 4 |
| MTBDA102 | DATA STRUCTURES AND ALGORITHMS | 4 | -- | 25 | 75 | 100 | 4 |
| MTBDA103 | DATABASE MANAGEMENT SYSTEMS | 4 | -- | 25 | 75 | 100 | 4 |
| MTBDA104 | COMPUTER ORGANIZATION AND ARCHITECTURE | 4 | -- | 25 | 75 | 100 | 4 |
| MTBDA105 | ADVANCED OPERATING SYSTEMS | 4 | -- | 25 | 75 | 100 | 4 |
| MTBDA106 | COMPUTER NETWORKS | 4 | -- | 25 | 75 | 100 | 4 |
| MTBDA107 | DATA STRUCTURES LAB | - | 3 | 50 | 50 | 100 | 2 |
| MTBDA108 | DBMS LAB | -- | 3 | 50 | 50 | 100 | 2 |
| TOTAL | | 24 | 6 | 250 | 550 | 800 | 28 |

**MTCST101,MTBDA101:MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common for MTech CST and MTech CST with Big Data Analytics)**

| | | | |
|------------------|---------------------|------------------|-------------|
| Theory | : 4 Hrs/week | Credits | : 4 |
| Int Marks | : 25 | Ext Marks | : 75 |

UNIT - I

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

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

UNIT - II

Finite Automata and Regular expressions: 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.

UNIT - III

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.

UNIT - IV

Turing Machines and Undecidability: Design and Techniques for Construction of Turing Machines, Undecidability of PCP. Chomsky Hierarchy, Regular Grammars, Unrestricted Grammars, Context Sensitive languages, Relationship between classes of languages.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Theory of Computer Science By Mishra & Chandra Sekharan, PHI.
2. Introduction to languages and theory of computation – John C. Martin (MGH)

MTCST102,MTBDA102: DATA STRUCTURES AND ALGORITHMS
(Common for MTech CST and MTech CST with Big Data Analytics)

| | | | |
|------------------|---------------------|------------------|-------------|
| Theory | : 4 Hrs/week | Credits | : 4 |
| Int Marks | : 25 | Ext Marks | : 75 |

UNIT-I

Introduction to Data Structures: Information and Meaning, Representation of Multidimensional arrays, Review of some basic c programs: addition multiplication of matrices, reversing a given integer number.

Algorithm Analysis: Model, what to Analyze, Running time calculation – A Simple Example, General Rules, Logarithms in the running time – Binary Search.

UNIT-II

Lists, Stacks & Queues: Abstract Data Types, The List ADT-Simple Array Implementation Lists, Simple Linked Lists, implementation of list, The ADT-Stack Model, Implementation and Applications of Stacks. The Queue ADT-Queue Model Array Implementation of Queues, Application of Queues.

Trees: Implementation and traversal of trees, Binary Trees and Binary search trees, Concepts of AVL Trees, Splay Trees and B-Trees.

UNIT-III

Hashing: Hash Function, Separate Chains, Hash table without Linked List – Linear Probing, Quadratic Probing, Double hashing, Rehashing, Extendible Hashing

Priority Queues: Model, Simple Implementation, Binary Heap: Structure Property, Heap-Order Property, Basic Heap Operations.

UNIT-IV

Sorting: Insertion Sort, Bubble Sort, Selection Sort, Shell Sort, Heap Sort, Merge Sort, Quick Sort, Bucket Sort and External Sorting.

Graph: Definition, Topological Sort, Shortest-Path Algorithm-Unweighted Shortest Paths, Dijkstra's Algorithm, Graphs with negative Edge costs, Acyclic Graphs, Shortest Path Examples, Network Flow Problem, Minimum Spanning Tree: Prim's Algorithm, Kruskal's Algorithm.

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 Structures, Algorithms and Applications in C++, SartajSahni, McGraw-Hill.
3. Data Structures Using C by Yddishlangsam, Moshe J. Augenstein and Aaron M, Tanenbaum, PHI 2nd Edition. (Chapter 1 to 8)

MTCST103,MTBDA103: DATABASE MANAGEMENT SYSTEMS
(Common for MTech CST and MTech CST with Big Data Analytics)

| | | | |
|------------------|---------------------|------------------|-------------|
| Theory | : 4 Hrs/week | Credits | : 4 |
| Int Marks | : 25 | Ext Marks | : 75 |

UNIT-I

Introduction to database systems: Concept of relational models and relational algebra, Database applications, Purpose of database systems, database languages, database architecture, database users and administrators.

Database design and ER overview: Overview of the design process, ER-models, constraints, entity relationship diagram, entity relationship design issues, and weak entity sets, extended ER features, database design for banking enterprise, reduction to relational schemas.

Relational database design: Features of good relational designs, atomic domains and first normal forms, normalization and schema refinement, decomposition using functional dependencies, Decomposition using functional dependencies: BCNF decomposition, 3NF decomposition, comparison of BCNF and 3NF, Multi valued dependence, Fourth normal forms.

UNIT-II

Database application design and development: User interfaces and tools, web interface to Databases, web fundamentals, servlets and JSP, triggers, authorization in SQL.

Indexing and hashing: Basic concept, ordered indices, B+ tree index files, B tree index files, multiple key access, static hashing, dynamic hashing, comparison of ordered indexing and hashing bit map indices, index definition in SQL.

XML: Structure of XML data, XML doc schema, Storage of XML data.

UNIT-III

Query Processing: measures of query cost, selection operation, sorting, joins operation.

Query Optimization: Transformation of relational expressions, estimating statistics of expression results.

Transaction Management: Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, serializability, recoverability, implementation of isolation, testing for serializability.

Concurrency Control: Lock based protocols, timestamp, based protocols, validation based protocols, multiple granularity, multiseesion schemes, deadlock handling insert and delete operations.

UNIT-IV

Database-System Architectures: centralized and client server architectures, server system architectures, parallel systems, distributed systems

Parallel Databases: Introduction, I/O parallelism, inter query parallelism, intra query parallelism.

Distributed Databases: homogeneous and heterogeneous databases, distributed data storage, distributed transactions.

TEXT BOOK:

1.Database system concepts, Abraham Silverschatz Henry F Korth S. Sudarsan McGraw-Hill publications sixth edition.

REFERENCE BOOKS:

1. Fundamentals of Database System,Elmasri, Navathe, Pearson Educaiton.

2. Database Management Systems, Raghu Ramakrishnan,JohannesGehrke,McGraw-Hill.

MTCST104,MTBDA104: COMPUTER ORGANIZATION AND ARCHITECTURE
(Common for MTech CST and MTech CST with Big Data Analytics)

| | | | |
|------------------|---------------------|------------------|-------------|
| Theory | : 4 Hrs/week | Credits | : 4 |
| Int Marks | : 25 | Ext Marks | : 75 |

UNIT-I

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.

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.

UNIT-II

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

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

UNIT-III

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.

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

UNIT-IV

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

TEXT BOOKS:

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 Edition 1985.

REFERENCE BOOKS:

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).

MTCST105,MTBDA105: ADVANCED OPERATING SYSTEMS
(Common for MTech CST and MTech CST with Big Data Analytics)

| | | | |
|------------------|---------------------|------------------|-------------|
| Theory | : 4 Hrs/week | Credits | : 4 |
| Int Marks | : 25 | Ext Marks | : 75 |

UNIT-I

Distributed Operating Systems: Introduction, Definition, Goals, Connecting Users and resources transparency, Openness, Scalability, Hardware Concepts: Multiprocessors, Homogeneous and heterogeneous multi computer systems. Software Concepts: Distributed OS, Networking OS, Middleware. client server model: Clients and servers, Application layering, Architectures.

UNIT-II

Process: Threads-Threads in Distributed Systems. Client- User interfaces, Client-Side Software for distribution transparency. Servers-General design issues, Object servers. Code Migration- Approaches to code migration, migration and local resources, Migration in Heterogeneous systems. Software agents- Software agents in Distributed Systems, Agent Technology.

UNIT-III

Communication: Layered Protocols-lower level, transport protocols, higher level protocols. Remote procedure call: Basic RPC operations, Parameter passing. Remote object invocation- Distributed Objects, Binding a client to an object, Static versus Dynamic method invocation, Parameter passing. Message Oriented Communication-Persistence and Synchronicity in communication, message oriented-transient communication, message oriented persistent communication.

UNIT-IV

Synchronization: Clock Synchronization- Physical Clocks, Clock Synchronization Algorithms. Logical Clocks- Lamport Time Stamps, Vector Time Stamps. Global State. Election Algorithms- Bully and Ring Algorithms. Mutual Exclusion-Centralized Algorithm, Distributed Algorithm, Token Ring Algorithm. Distributed Transaction-The Transaction Model, Classification of Transactions, Implementation, Concurrency Control.

Fault Tolerance: Introduction to Fault Tolerance, failure models, failure masking by redundancy.

TEXTBOOKS:

1. Distributed Systems by Andrew S, Tanenbum, Maarten Vansteen, Second Edition.
2. Distributed Operating Systems by Andrew S Tanenbaum Pearson Publications

REFERENCE BOOKS:

1. Operating System Concepts, Silberschatz & Galvin, Wiley.
2. Advanced Concepts in Operating Systems, M Singhal and NG Shivaratri, TMH.
3. Operating Systems: A Design Oriented Approach. Charles Crowley, Tata HillCo.
4. Modern Operating Systems, Andrew S, Tanenbum 2nd Edition, 1995, PHI.
5. Advanced Concepts in Operating Systems. Distributed, Database and Multiprocessor Operating Systems. Mukeshshingal, Nirajan G. Shivaratri, TMH edn.

MTCST106, MTBDA106: COMPUTER NETWORKS
(Common for MTech CST and MTech CST with Big Data Analytics)

| | | | |
|------------------|---------------------|------------------|-------------|
| Theory | : 4 Hrs/week | Credits | : 4 |
| Int Marks | : 25 | Ext Marks | : 75 |

UNIT – I

Introduction to Computer Networks: Introduction, Network Hardware and Software, Reference Models: OSI, TCP/IP, Data Communication Services & Network Examples, Internet Based Application.

Data Communications: Transmission Media: Guided media, Unguided media: Wireless, Multiplexing: FDM, TDM, Switching: Message, Circuit, Packet.

UNIT-II

Data Link Layer: Data Link Control, Error Detection & Correction, Sliding Window Protocols, LAN & MANs: IEEE Standards for LANs & MANs – IEEE Standards 802.3(Ethernet), 802.4(Token Bus), 802.5(Token Ring).

Design Issues in Networks: Routing Algorithms: Optimality principle, shortest path, Flooding, Distance Vector Routing, Link State Routing, and Hierarchical Routing. Congestion Control: Open Loop (Retransmission, Window Policy, Acknowledgment Policy, Discarding Policy, Admission Policy), Closed Loop (Back Pressure, Choke Packet, Implicit Signaling, Explicit signaling), Token Bucket Algorithm, Leaky Bucket Algorithm.

UNIT-III

Internetworking: How Networks Differ, how Networks connected, Tunneling, Internetwork Routing, Packet Fragmentation, Network Layer, IP Version 4 Protocol, IP Address, IPv6.

Transport layer: Transport Service, Elements of Transport Protocols, Congestion control, Internet Transport Protocols: UDP, TCP, performance issues. Overview of DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols, WWW.

UNIT-IV

Network Devices: Overview of Repeaters, Hubs, Switch, Modems, Bridges (use of bridges, learning bridges, spanning tree bridges), Routers, Gateways, Multiprotocol Routers, Wireless Access Points, Transceivers, Firewalls, and Proxies.

Advanced Concepts in Networks: Overview of Cellular Networks, Adhoc Networks, Mobile Adhoc Networks and Virtual Private Networks. Delay Tolerant Networks (DTN) IPv6

TEXT BOOKS:

1. Computer Networks, Andrews S. Tenenbaum, Edition 5, PHI, ISBN:81-203-1165-5
2. Data Communications and Networking, Behrouz A Forouzan, TMH, 2nd Edition, ISBN: 0-07-049935-7

REFERENCE BOOKS:

1. Computer Networks, mayank Dev, CENGAGE.
2. Computer Networks, A system Approach, 5th Edition, Larry L Perterson & Bruce S Davie, Elsevier.
3. An Engineering Approach to Computer Networks – S. Keshav, 2nd Edition, Pearson Education.
4. Understanding Communications & Networks, 3rd edition, W.A. Shay, Thomson.

MTCST107,MTBDA107: DATA STRUCTURES LAB
(Common for MTech CST and MTech CST with Big Data Analytics)

| | | | |
|------------------|---------------------|------------------|------------|
| Lab | : 3 Hrs/week | Credits | : 2 |
| Int Marks | : 50 | Ext Marks | :50 |

Implement the following Data Structures and Algorithms using C/C++/JAVA.

1. Perform various operations such as insertion, deletion, display on single linked lists.
2. Implement
 - (i) Stacks using linked list.
 - (ii) Queues using linked list.
3. Implement different types of searching techniques on a given list
 - (i) Sequential search
 - (ii) Transpose sequential search
 - (iii) Binary search
 - (iv) Fibonacci search
4. Demonstrate different types of sortings on a given list
 - (i) Bubble sort
 - (ii) Insertion sort
 - (iii) Selection sort
 - (iv) Merge sort
5. Different types of sortings on a given list
 - (i) Quick sort
 - (ii) Shell sort
 - (iii) Radix sort
 - (iv) Topological sort
6.
 - (i) To convert the given infix expression to postfix expression
 - (ii) To evaluate the given postfix expression.
7. Operations on graphs
 - (i) Vertex insertion.
 - ii) Vertex deletion.
 - iii) Edge insertion.
 - (iv) Edge deletion.
 - (v) BFS.
 - (vi) DFS.
8. Implement dictionaries using hashing technique
9. Perform various operations on binary heap.
10. Perform various operations on Binary search tree.
11. Perform operations on AVL trees.
12. Perform various operations on B-tree.

MTCST108,MTBDA108: DATABASE MANAGEMENT SYSTEMS LAB
(Common for MTech CST and MTech CST with Big Data Analytics)

| | | | |
|------------------|---------------------|------------------|------------|
| Lab | : 3 Hrs/week | Credits | : 2 |
| Int Marks | : 50 | Ext Marks | :50 |

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, ODBC 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. The logical design performs the following tasks: 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. Identify the functional dependencies in each relation Normalize to the highest normal form possible. Perform physical design based on above logical design using any RDBMS.

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.