

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.

B. TECH. INFORMATION TECHNOLOGY (R09)

II YEAR

I Semester

COURSE STRUCTURE

Code	Subject	L	T/P/D	C
	Data Communication Systems	3	1	3
	Mathematical Foundations of Computer Science	3	1	3
	Data Structures through C++	4	1	4
	Digital Logic Design & and Computer Organization	4	1	4
	Basic Electrical Engineering	3	1	3
	Electronic Devices & Circuits	4	-	4
	Data Structures Lab through C++	0	3	2
	Electrical and Electronics Lab	0	3	2
	Total	21	11	25

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DATA COMMUNICATION SYSTEMS

Unit I :

INTRODUCTION TO DATA COMMUNICATIONS AND NETWORKING: Standards Organizations for Data Communications, Layered Network Architecture, Open Systems Interconnection, Data Communications Circuits, Serial and parallel Data Transmission, Data communications Circuit Arrangements, Data communications Networks, Alternate Protocol Suites.

SIGNALS, NOISE, MODULATION, AND DEMODULATION :

Signal Analysis, Electrical Noise and Signal-to-Noise Ratio, Analog Modulation Systems, Information Capacity, Bits, Bit Rate, Baud, and *M*-ary Encoding, Digital Modulation.

Unit II :

METALLIC CABLE TRANSMISSION MEDIA :

Metallic Transmission Lines, Transverse Electromagnetic Waves, Characteristics of Electromagnetic Waves, Transmission Line Classifications, Metallic Transmission Line Types, Metallic Transmission Line Equivalent Circuit, Wave Propagation on Metallic Transmission Lines, Metallic Transmission Line Losses.

OPTICAL FIBER TRANSMISSION MEDIA :

Advantages of Optical Fiber Cables, Disadvantages of Optical Fiber Cables, Electromagnetic spectrum, Optical Fiber Communications System Block Diagram, Optical Fiber construction, The Physics of Light, Velocity of Propagation, Propagation of Light Through an Optical fiber Cable, Optical Fiber Modes and Classifications, Optical Fiber Comparison, Losses in Optical Fiber Cables, Light sources, Light Detectors, Lasers.

Unit III :

DIGITAL TRANSMISSION :

Pulse Modulation, Pulse code Modulation, Dynamic Range, Signal Voltage –to-Quantization Noise Voltage Ratio, Linear Versus Nonlinear PCM Codes, Companding, PCM Line Speed, Delta Modulation PCM and Differential PCM.

MULTIPLEXING AND T CARRIERS :

Time- Division Multiplexing, T1 Digital Carrier System, North American Digital Multiplexing Hierarchy, Digital Line Encoding, T Carrier systems, European Time- Division Multiplexing, Statistical Time – Division Multiplexing, Frame Synchronization, Frequency- Division Multiplexing, Wavelength- Division Multiplexing, Synchronous Optical Network

Unit IV :

WIRELESS COMMUNICATIONS SYSTEMS :

Electromagnetic Polarization, Rays and Wavefronts, Electromagnetic Radiation, Spherical Wavefront and the Inverse Square Law, wave Attenuation and Absorption, Optical Properties of Radio Waves, Terrestrial Propagation of Electromagnetic Waves, Skip Distance, Free-Space Path Loss, Microwave Communications Systems, Satellite Communications Systems.

Unit V :

TELEPHONE INSTRUMENTS AND SIGNALS:

The Subscriber Loop, Standard Telephone Set, Basic Telephone Call Procedures, Call Progress Tones and Signals, Cordless Telephones, Caller ID, Electronic Telephones, Paging systems.

THE TELEPHONE CIRCUIT:

The Local Subscriber Loop, Telephone Message- Channel Noise and Noise Weighting, Units of Powers Measurement, Transmission Parameters and Private-Line Circuits, Voice-Frequency Circuit Arrangements, Crosstalk.

Unit VI :

CELLULAR TELEPHONE SYSTEMS:

First- Generation Analog Cellular Telephone, Personal Communications system, Second-Generation Cellular Telephone Systems, N-AMPS, Digital Cellular Telephone, Interim Standard, North American Cellular and PCS Summary, Global system for Mobile Communications, Personal Communications Satellite System.

Unit VII:

DATA COMMUNICATIONS CODES, ERROR CONTROL, AND DATA FORMATS:

Data Communications Character Codes, Bar Codes, Error Control, Error Detection, Error Correction, Character Synchronization.

DATA COMMUNICATIONS EQUIPMENT:

Digital Service Unit and Channel Service Unit, Voice- Band Data Communication Modems, Bell Systems-Compatible Voice- Band Modems, Voice- Band Modern Block Diagram, Voice- Band Modem Classifications,

Asynchronous Voice-Band Modems, Synchronous Voice-Band Modems, Modem Synchronization, ITU-T Voice-Band Modem Specifications, 56K Modems, Modem Control: The AT Command Set, Cable Modems, Probability of Error and Bit Error Rate.

Unit VIII:

DATA –LINK PROTOCOLS:

Data –Link Protocol Functions, Character –and Bit- Oriented Protocols, Data Transmission Modes, Asynchronous Data – Link Protocols, Synchronous Data – Link Protocols, Synchronous Data – Link Control, High – Level Data – Link Control.

TEXT BOOKS:

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education.

Reference Books

1. Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.TMH.
2. Computer Communications and Networking Technologies, Gallow, Second Edition Thomson
3. Computer Networking and Internet, Fred Halsl, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education

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MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

UNIT-I

Mathematical Logic : Statements and notations, Connectives, Well formed formulas, Truth Tables, tautology, equivalence implication, Normal forms.

UNIT-II

Predicates : Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving.

UNIT-III

Set Theory : Properties of binary Relations, equivalence, compatibility and partial ordering relations, Hasse diagram. Functions: Inverse Function Comports of functions, recursive Functions, Lattice and its Properties, Pigeon hole principles and its application.

UNIT-IV

Algebraic structures : Algebraic systems Examples and general properties, Semi groups and monads, groups sub groups' homomorphism, Isomorphism.

UNIT-V

Elementary Combinatorics: Basis of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion – Exclusion.

UNIT-VI

Recurrence Relation : Generating Functions, Function of Sequences Calculating Coefficient of generating function, Recurrence relations, Solving recurrence relation by substitution and Generating funds. Characteristics roots solution of In homogeneous Recurrence Relation.

UNIT-VII

Graph Theory : Representation of Graph, DFS, BFS, Spanning Trees, planar Graphs

UNIT-VIII

Graph Theory and Applications, Basic Concepts Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers

TEXT BOOKS :

1. Discrete and Combinational Mathematics- An Applied Introduction-5th Edition – Ralph. P.Grimaldi.Pearson Education
2. Discrete Mathematical Structures with applications to computer science Trembly J.P. & Manohar .P, TMH
3. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition.TMH.

REFERENCES :

1. Discrete Mathematics with Applications, Thomas Koshy, Elsevier
2. Discrete Mathematical Structures, Bernard Kolman, Roberty C. Busby, Sharn Cutter Ross, Pearson Education/PHI.
3. Discrete Mathematical structures Theory and application-Malik & Sen
4. Discrete Mathematics for Computer science, Garry Haggard and others, Thomson.
5. Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott, A. Kandel, T.P. Baker Prentice Hall.
6. Logic and Discrete Mathematics, Grass Man & Trembley, Person Education.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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II Year B.Tech. IT I-Sem (R09)

L	T/P/D	C
4	1	4

DATA STRUCTURES THROUGH C++

Unit I:-

C++ Class Overview- Class Definition, Objects, Class Members, Access Control, Class Scope, Constructors and destructors, parameter passing methods, Inline functions, static class members, this pointer, friend functions, dynamic memory allocation and deallocation (new and delete), exception handling.

Unit II:-

Function Overloading, Operator Overloading, Generic Programming- Function and class templates, Inheritance basics, base and derived classes, inheritance types, base class access control, runtime polymorphism using virtual functions, abstract classes, streams I/O.

Unit III:-

Algorithms, performance analysis-time complexity and space complexity, O-notation, Omega notation and Theta notation, Review of basic data structures - the list ADT, stack ADT, queue ADT, implementation using template classes in C++, sparse matrix representation.

Unit IV:-

Dictionaries, linear list representation, skip list representation, operations- insertion, deletion and searching, hash table representation, hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing, comparison of hashing and skip lists.

Unit V:-

Priority Queues – Definition, ADT, Realizing a Priority Queue using Heaps, Definition, insertion, Deletion, Application-Heap Sort, External Sorting- Model for external sorting, Multiway merge, Polyphase merge.

Unit VI:-

Search trees (part I) : Binary search trees, definition, ADT, implementation, operations-searching, insertion and deletion, Balanced search trees- AVL trees, definition, height of an AVL tree, representation, operations-insertion, deletion and searching.

Search trees (part II) : Introduction to Red –Black trees and Splay Trees, B-Trees-B-Tree of order m, height of a B-Tree, insertion, deletion and searching, Comparison of Search Trees.

Unit VII:-

Divide and Conquer- General method, applications – Binary search, merge sort, quick sort, Strassen's matrix multiplication

Efficient non recursive tree traversal algorithms, Biconnected components. Disjoint set operations, union and find algorithms.

Unit VIII:-

Greedy method and Dynamic programming : General method (Greedy), Minimum cost spanning trees, Job sequencing with deadlines, General method (Dynamic Programming), Optimal binary search trees, 0/1 knapsack problem, Ordering Matrix Multiplications

TEXT BOOKS :

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education, second edition.
2. Data structures, Algorithms and Applications in C++, S.Sahni, University press (India) pvt ltd, 2nd edition, Orient Longman pvt.ltd.

REFERENCE :

1. Data structures and Algorithms in C++, Michael T. Goodrich, R.Tamassia and D.Mount, Seventh Edition Wiley student edition, John Wiley and Sons.
2. Data Structures and Algorithms in C++, Third Edition, Adam Drozdek, Thomson
3. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.
4. C++, The Complete Reference, 4th Edition, Herbert Schildt, TMH.
5. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI/Pearson Education.

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II Year B.Tech. IT I-Sem (R09)

L	T/P/D	C
4	1	4

DIGITAL LOGIC DESIGN & COMPUTER ORGANIZATION

UNIT I :

BASIC STRUCTURE OF COMPUTERS : Computer Types, Functional unit, Basic OPERATIONAL concepts, Bus structures, Software, Performance, multiprocessors and multi computers. Data Representation. Fixed Point Representation. Floating – Point Representation. Error Detection codes.

UNIT II : DIGITAL LOGIC CIRCUITS-1

UNIT III : DIGITAL LOGIC CIRCUITS-2

UNIT IV :

COMPUTER ARITHMETIC : Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit Decimal Arithmetic operations.

UNIT-V : INSTRUCTIONS SET & ADDRESSING

UNIT-VI : PROCESSOR ORGANIZATION

UNIT VII : MEMORY ORGANIZATION

UNIT-VIII

INPUT-OUTPUT ORGANIZATION : Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt Direct memory Access, Input –Output Processor (IOP) Serial communication; Introduction to peripheral component, Interconnect (PCI) bus. Introduction to standard serial communication protocols like RS232, USB, IEEE1394.

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3	1	3

BASIC ELECTRICAL ENGINEERING

UNIT - I

Introduction to Electrical Engineering : Essence of electricity, Conductors, semiconductors and insulators (elementary treatment only); Electric field; electric current, potential and potential difference, electromotive force, electric power, ohm's law, basic circuit components, electromagnetism related laws, Magnetic field due to electric current flow, force on a current carrying conductor placed in a magnetic field, Faradays laws of electromagnetic induction. Types of induced EMF's, Kirchhoff's laws. Simple problems.

UNIT-II

Network Analysis : Basic definitions, types of elements, types of sources, resistive networks, inductive networks, capacitive networks, series parallel circuits, star delta and delta star transformation, Network theorems- Superposition, Thevenin's, Maximum power transfer theorems and simple problems.

UNIT-III

Magnetic Circuits : Basic definitions, analogy between electric and magnetic circuits, magnetization characteristics of Ferro magnetic materials, self inductance and mutual inductance, energy in linear magnetic systems, coils connected in series, attracting force of electromagnets.

UNIT-IV

Alternating Quantities : Principle of ac voltages, waveforms and basic definitions, relationship between frequency, speed and number of poles, root mean square and average values of alternating currents and voltage, form factor and peak factor, phasor representation of alternating quantities, the J operator and phasor algebra, analysis of ac circuits with single basic network element, single phase series circuits, single phase parallel circuits, single phase series parallel circuits, power in ac circuits.

UNIT-V

Transformers : Principles of operation, Constructional Details, Ideal Transformer and Practical Transformer, Losses, Transformer Test, Efficiency and Regulation Calculations (All the above topics are only elementary treatment and simple problems).

UNIT-VI

Direct current machines : Principle of operation of dc machines, armature windings, e.m.f equation in a dc machine, Torque production in a dc machine, Operation of a dc machine as a generator, operation of a dc machine as a motor.

UNIT-VII

A.C Machines : Three phase induction motor, principle of operation, slip and rotor frequency, torque (simple problems). Synchronous Machines: Principle of operation, EMF equation (Simple problems on EMF). Synchronous motor principle and operation (Elementary treatment only)

UNIT VIII

Basic Instruments : Introduction, classification of instruments, operating principles, essential features of measuring instruments, Moving coil permanent magnet (PMMC) instruments, Moving Iron of Ammeters and Voltmeters (elementary Treatment only)

TEXT BOOKS :

1. Basic Electrical Engineering - By M.S.Naidu and S. Kamakshiah – TMH.
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.

REFERENCES :

1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath PHI.
2. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.
3. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson.

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L	T/P/D	C
4	-	4

ELECTRONIC DEVICES AND CIRCUITS

UNIT-I

ELECTRON DYNAMICS AND CRO: Motion of charged particles in electric and magnetic fields. Simple problems involving electric and magnetic fields only. Electrostatic and magnetic focusing. Principles of CRT, deflection sensitivity (Electrostatic and magnetic deflection), Parallel Electric and Magnetic fields, Perpendicular Electric and Magnetic fields.

UNIT- II

JUNCTION DIODE CHARACTERISTICS : Review of semi conductor Physics – n and p –type semi conductors, Mass Action Law, Continuity Equation, Hall Effect, Fermi level in intrinsic and extrinsic semiconductors, Open-circuited p-n junction, The p-n junction Energy band diagram of PN diode, PN diode as a rectifier (forward bias and reverse bias), The current components in p-n diode, Law of junction, Diode equation, Volt-ampere characteristics of p-n diode, Temperature dependence of VI characteristic, Transition and Diffusion capacitances, Step graded junction, Breakdown Mechanisms in Semi Conductor (Avalanche and Zener breakdown) Diodes, Zener diode characteristics, Characteristics of Tunnel Diode with the help of energy band diagrams, Varactor Diode, LED, LCD. And photo diode

UNIT- III

RECTIFIERS, FILTERS AND REGULATORS : Half wave rectifier, ripple factor, full wave rectifier, Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L-section filter, Π - section filter, Multiple L-section and Multiple Π section filter, and comparison of various filter circuits in terms of ripple factors, Simple circuit of a regulator using zener diode, Series and Shunt voltage regulators

UNIT- IV

TRANSISTOR and FET CHARACTERISTICS : Junction transistor, Transistor current components, Transistor as an amplifier, Transistor construction, Detailed study of currents in a transistor, Transistor alpha, Input and Output characteristics of transistor in Common Base, Common Emitter, and Common collector configurations, Relation between Alpha and Beta, typical transistor junction voltage values, JFET characteristics (Qualitative and Quantitative discussion), Small signal model of JFET, MOSFET characteristics (Enhancement and depletion mode), Symbols of MOSFET, Comparison of Transistors, Introduction to SCR and UJT.

UNIT-V

BIASING AND STABILISATION : BJT biasing, DC equivalent model, criteria for fixing operating point, Fixed bias, Collector to base bias, Self bias techniques for stabilization, Stabilization factors, (S_v, S_i, S_{β}), Compensation techniques, (Compensation against variation in V_{BE}, I_{co} .) Thermal run away, Thermal stability,

UNIT- VI

AMPLIFIERS : Small signal low frequency transistor amplifier circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-parameters: voltage gain, current gain, Input impedance and Output impedance. Comparison of transistor configurations in terms of A_v, R_i, A_v, R_o ,

UNIT- VII

FEEDBACK AMPLIFIERS : Concept of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on input and output characteristics, Voltage series, voltage shunt, current series, and current shunt feedback amplifiers with discrete components and their analysis

UNIT-VIII

OSCILLATORS : Condition for oscillations. RC-phase shift oscillators with Transistor and FET, Hartley and Colpitts oscillators, Wein bridge oscillator, Crystal oscillators, Frequency and amplitude stability of oscillators,

TEXT BOOKS :

1. Electronic Devices and Circuits – J.Millman, C.C.Halkias, and Satyabratha Jit Tata McGraw Hill, 2nd Ed., 2007.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall,9th Edition,2006.

REFERENCES :

1. Electronic Devices and Circuits – T.F. Bogart Jr., J.S.Beasley and G.Rico, Pearson Education, 6th edition, 2004.
2. Principles of Electronic Circuits – S.G.Burns and P.R.Bond, Galgotia Publications, 2nd Edn..., 1998.
3. Microelectronics – Millman and Grabel, Tata McGraw Hill, 1988.
4. Electronic Devices and Circuits – Dr. K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.
5. Electronic Devices and Circuits- Prof GS N Raju I K International Publishing House Pvt .Ltd 2006



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L	T/P/D	C
-	3	2

DATA STRUCTURES LAB THROUGH C++

Objectives:

- To make the student learn a object oriented way of solving problems.
- To make the student write ADTS for all data structures.
- To make the student learn different algorithm design techniques.

Recommended Systems/Software Requirements:

- Intel based desktop PC with minimum of 166 MHZ or faster processor with atleast 64 MB RAM and 100 MB free disk space
- C++ compiler and STL Recommended

Week1- C++ programs to implement the following using an array.

- a) Stack ADT b) Queue ADT

Week2- Write C++ programs to implement the following using a singly linked list.

- a) Stack ADT b) Queue ADT

Week3- Write C++ programs to implement the deque (double ended queue) ADT using a doubly linked list and an array.

Week 4-Write a C++ program to perform the following operations:

- a) Insert an element into a binary search tree.
b) Delete an element from a binary search tree.
c) Search for a key element in a binary search tree.

Week5-Write C++ programs that use non-recursive functions to traverse the given binary tree in

- a) Preorder b) inorder and c) postorder.

Week6-Write C++ programs for the implementation of bfs and dfs for a given graph.

Week7- Write C++ programs for implementing the following sorting methods:

- a) Merge sort b) Heap sort

Week8-Write a C++ program to perform the following operations

- a) Insertion into a B-tree b) Deletion from a B-tree

Week9-Write a C++ program to perform the following operations

- a) Insertion into an AVL-tree b) Deletion from an AVL-tree

Week10-Write a C++ program to implement Kruskal's algorithm to generate a minimum cost spanning tree.

Week11-Write a C++ program to implement Prim's algorithm to generate a minimum cost spanning tree.

Week12-Write a C++ program to implement all the functions of a dictionary (ADT) using hashing.

(Note: Use Class Templates In the above Programs)

TEXT BOOKS :

- 1.Data Structures and Algorithms in C++, Third Edition, Adam Drozdek, Thomson.
- 2.Data Structures using C++, D.S. Malik, Thomson

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II Year B.Tech. IT I-Sem (R09)

T	P	C
-	3	2

ELECTRICAL AND ELECTRONICS LAB

PART - A

1. Serial and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
2. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
3. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
4. Verification of Superposition and Reciprocity theorems.
5. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
6. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.
7. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance.
8. Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC Shunt machine working as motor and generator).
9. Brake test on DC shunt motor. Determination of performance Characteristics.
10. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
11. Brake test on 3-phase Induction motor (performance characteristics).
12. Regulation of alternator by synchronous impedance method

PART - B

1. Identification, Specifications and Testing of R, L, C Components (colour codes), Potentiometers, Switches (SPDT, DPDT and DIP), Coils, Gang Condensers, Relays, Bread Boards. Identification and Specifications of active devices, Diodes, BJTs, Lowpower JFETs, MOSFETs, LEDs, LCDs, SCR, UJT, Linear and Digital ICs.
2. PN Junction Diode Characteristics (Forward bias, Reverse bias)
3. Zener Diode Characteristics
4. Transistor CE Characteristics (Input and Output)
5. Rectifier without Filters (Full wave & Half wave)
6. Rectifier with Filters (Full wave & half wave)
7. SCR Characteristics
8. FET Characteristics
9. CE and CC Amplifier
10. Feedback Amplifier (Voltage Series/Current series)
11. RC Phase Shift Oscillator
12. Hartely/Colpitts Oscillator