PUNJAB TECHNICAL UNIVERSITY, KAPURTHALA

Scheme& Syllabus of
B. Tech. Electronics & Computer Engineering [ELE]

Batch 2023 Onwards

Third Semester **Contact Hours: 29 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTAM-303-23	Mathematics-III (Integral Transforms, Probability & Statistics)	4	1	-	40	60	100	5
BTCS-305	Object Oriented Programming using C++	3	1	-	40	60	**100**	**4**
BTEC-301	Analog Devices & Circuits	3	1	-	40	60	**100**	**4**
BTEC-302	Digital Circuit and Logic Design	3	1	-	40	60	**100**	**4**
BTEC-303	Network Analysis and Synthesis	3	1	-	40	60	**100**	**4**
BTEC-304	Lab Analog Devices & Circuits	-	-	2	30	20	**50**	**1**
BTEC-305	Lab Digital Circuit and Logic Design	-	-	2	30	20	**50**	**1**
BTCS-309	Lab Object Oriented Programming	-	-	4	30	20	**50**	**2**
Workshop Training *					60	40	**100**	
	TOTAL	**16**	**5**	**8**	**350**	**400**	**750**	**25**

***The marks will be awarded on the basis of 4 weeks workshop training conducted after 2nd Semester**

Fourth Semester Electronics and Computer Engineering **Contact Hours: 33 Hrs**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCS-304	Data Structures	3	1	-	40	60	**100**	**4**
BTEE-402	Linear Control Systems	4	1	-	40	60	100	5
BTEC-402	Signal & Systems	3	1	-	40	60	**100**	**4**
BTCS-404	Microprocessor and Assembly Language	3	1	-	40	60	**100**	**4**
BTEC-404	Electronic Measurement & Instrumentation	3	1	-	40	60	**100**	**4**
BTEL-401	Numerical Methods	3	1	-	40	60	**100**	**4**
BTCS-408	Microprocessors & Assembly Language Programming Lab	-	-	2	30	20	**50**	**1**
BTEL-402	Lab Numerical Methods	-	-	2	30	20	**50**	**1**
BTCS-306	Lab Data Structures	-	-	4	30	20	**50**	**2**
General Fitness					100	NA	**100**	
	TOTAL	19	**6**	**4**	**430**	**420**	**850**	**29**

*Code of Data Structures theory and lab has been kept same as that of B.Tech (CSE) 3rd Sem.

*Code of Linear Control Systems theory and lab, has been kept same as that of B.Tech (ECE) 4th Sem

*Code of Numerical Methods theory and lab is being proposed.

Third Semester

BTAM 303-23	Mathematics-III (Integral Transforms, Probability & Statistics)	L-4, T-1, P-0	4 Credits

Pre-requisite: Intermediate Calculus and Basic algebra

Course Objectives: The objective of this course is to introduce integral transforms and fundamental concepts of theory of probability and statistics. The major focus of the course will be on a systematic mathematical treatment of these concepts and their applications.

Course Outcomes: At the end of the course, the student will be able to

CO1	Apply Laplace transform for solving certain differential equations arising in mathematical modeling of various real-world phenomena.
CO2	Create Fourier series expansions of periodic functions, study of their properties and applications. Also to apply Fourier transform to deal with non-periodic functions.
CO3	Apply Z-transform for solving difference equations.
CO4	Understand and deal with randomness occurring in real world phenomena.
CO5	Understand and utilize theory of probability, discrete and continuous distributions.
CO6	Apply method of least squares in fitting of curves

Detailed Content:

Unit-I

Laplace Transform

Laplace Transform, Properties of Laplace Transform, Laplace Transform of Unit step function, Impulse function, Dirac-delta function, Periodic functions. Inverse Laplace Transform, convolution theorem, Evaluation of integrals by Laplace Transform, Applications to solve initial value problems of ordinary differential equations.

Unit II

Fourier Series and Transform

Fourier Series, half range Fourier Sine and Cosine series, Fourier integrals, Gibbs Phenomenon, Fourier transforms, Relation between Laplace and Fourier transform, Properties of Fourier Transforms, Convolution Theorem and applications.

Unit III

Z-Transform

Basic theory of Z transforms, Translation theorem, Scaling property of Z transforms, Initial and Final value theorems, Differentiation of Z transforms Solution of Difference equations using Z transform, Applications of Z transforms to find the sum of series.

Unit IV

Probability and Statistics

Measures of central tendency: Mean, median and mode. Definition of Probability, Discrete and continuous random variables, Probability distributions: Binomial, Poisson and Normal. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

Recommended Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. R K Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, 5th Edition, Narosa Publishing, 2017.
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003.
4. S. Ross, A First Course in Probability, Pearson Education India, 2002.
5. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley, 1968.
6. S.P. Gupta, Statistical Methods, Sultan Chand & Sons, 33rd Edition, 2005.

BTCS 305 Object Oriented Programming Using C++

Unit I Object-Oriented Programming Concepts: Introduction, comparision between procedural programming paradigm and object-oriented proramming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, messaging.

Unit II Standard Input/Output: Concept of streams, hierarchy of console stream classes, input/output using

overloaded operators >> and << and memberv functions of i/o stream classes, formatting output, formatting using ios class functions and flags, formatting using manipulators.

Unit III Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of *const* keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes**.**

Unit IV Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using *new* and *delete* operators, pointer to an object, *this* pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures**.**

Unit V Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, constructors and destructors with static members, initializer lists.

Unit VI Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type.

Unit VII Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors.

Unit VIII Virtual functions & Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract clasess, virtual destructors.

Unit IX Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions.

Unit X Templates and Generic Programming: Template concepts, Function templates, class templates, illustrative examples.

Unit XI Files: File streams, hierarchy of file stream classes, error handling during file operations, reading/writing of files, accessing records randomly, updating files.

Suggested Readings/ Books:

- Lafore R., **Object Oriented Programming in C++**, Waite Group.
- E. Balagurusamy, **Object Oriented Programming with C++**, Tata McGraw Hill.
- R. S. Salaria, **Mastering Object-Oriented Programming with C++**, Salaria Publishing House.
- Bjarne Stroustrup, **The C++ Programming Language**, Addison Wesley.
- Herbert Schildt, **The Complete Reference to C++ Language**, McGraw Hill-Osborne.
- Lippman F. B, **C++ Primer,** Addison Wesley.

BTEC301 Analog Devices & Circuits

Unit I Semiconductor diode Theory of PN junction diode, Band structure of open circuited PN junction, Volt Ampere Characteristics, Temperature Dependence of PN diode, LED, LCD and Photo- diodes, Tunnel diode, Zener diode as Voltage Regulator.

Unit II Transistors, Characteristics and Biasing Transistor, Types of Transistor, Transistor current components, Transistor as an Amplifier, Transistor characteristics in CB, CE and CC modes. Operating point, bias stability, various biasing circuits, stabilization against Ico, V_{BE} and beta, Construction, Characteristics & applications of Junction Field Effect Transistor (JFET), UJT and MOSFET.

Unit III Large Signal Amplifiers: Class A direct coupled with resistive load, Transformer coupled with resistive load, harmonic distortion, variation of output power with load, Push-Pull Amplifiers, operation of class- B push-pull amplifier, crossover distortion, transistor phase inverter, complementary- symmetry amplifier.

Unit IV Feedback Amplifiers and Oscillator: Feedback Concept, Effect of negative feedback on gain, bandwidth, stability, distortion and frequency Response, Sinusoidal Oscillators, Sinusoidal oscillators; criterion for oscillation, Different types of oscillators: RC Phase Shift, Wein Bridge, Hartley, Colpitts and Crystal Oscillators. Derivation of expression for frequency and amplitude of these oscillators.

Unit V Low & High Frequency Transistor Model: Transistor Hybrid Model, h parameter equivalent circuit of transistor, Analysis of transistor amplifier using h-parameters in CB, CE and CC configuration, The high frequency T model, hybrid pi CE transistor model, hybrid pi conductance in terms of low frequency h parameters.

Suggested Readings/ Books:

- Electronic Devices & Circuits by Millman- Halkias, Tata Mcgraw Hill
- Electronic Devices & Circuits Theory by Boylested, Pearson Education.
- Electronic Fundamentals & Application, by J.D. Ryder, PHI.
- Electronic Devices, by Floyd, Pearson Education.
- Electronics Devices & Circuits by J.B.Gupta, Katson.

BTEC302 Digital Circuit and Logic Design

Unit I Number System and Binary Code: Introduction, Binary, Octal and Hexadecimal Number System (Conversion, Addition & Subtractions). Signed and unsigned numbers, Binary Subtractions using 1's and 2's compliment, ASCII code, Excess 3 code, Grey code, BCD code and BCD additions.

Unit II Minimization of logic function: OR, AND,NOT,NOR,NAND,EX-OR, EX-NOR, Basic theorem of Boolean Algebra, Sum of Products and Product of Sums, canonical form, Minimization using K-map and Q-M method.

Unit III Combinational Circuits: Introduction, Combinational circuit design, Encoders, decoders, Adders, Sub tractors and Code converters. Parity checker, seven segment display, Magnitude comparators. Multiplexers, De-multiplexer, Implementation of Combinational circuit using MUX.

Unit IV Sequential Circuits: Introduction, flip flops, Clocked flip flops, SR, JK, D, T and edge triggered flip-flops. Excitation tables of Flip flops. Shift Registers, Type of Shift Registers, Counter, Counter types, counter design with state equation and state diagrams.

Unit V D/A and A/D Converters: Introduction, Weighted register D/A converter, binary ladder D/A converter, steady state accuracy test, D/A accuracy and resolution, parallel A/D converter, Counter type A/D converter Successive approximation A/D converter. Single and dual slope A/D converter, A/D accuracy and resolution.

Unit VI Semiconductor Memories: Introduction, Memory organisation, Classification and characteristics of memories, Sequential memories, ROMs, R/W memories. Content addressable memories. PLA and PAL.

Unit VII Logic Families: RTL, DCTL, DTL, TTL, ECL, CMOS and its various types, Comparison of logic families.

Suggested Readings / Books:

- Morris Mano, **Digital Design**, Prentice Hall of India Pvt. Ltd
- Donald P.Leach and Albert Paul Malvino, **Digital Principles and Applications**, 5 ed., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
- R.P.Jain, Modern **Digital Electronics**, 3 ed., Tata McGraw–Hill publishing Company limited, New Delhi, 2003.
- Thomas L. Floyd, **Digital Fundamentals**, Pearson Education, Inc, New Delhi, 2003
- Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, **Digital System -Principles and Applications**, Pearson Education.
- Srivastava/Srivastava/Srivastava**, Digital Design: HDL Based Approach,** Cengage Learning.
- Roth, **Fundamentals of Logic Design,** Cengage Learning

BTEC301 Network Analysis and Synthesis

Unit I Circuit Concepts: Independent and dependent sources, Signals and wave forms: Periodic and singularity voltages, step, ramp, impulse, doublet, loop currents and loop equations, node voltage and node equations, Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, and Reciprocity.

Unit II Time and Frequency Domain Analysis: Representation of basic circuits in terms of generalized frequency and their response, Laplace transform of shifted functions, transient and steady response, Time domain behaviors from poles and zeros, Convolution Theorem.

Unit III Network Synthesis: Network functions, Impedance and admittance function, Transfer functions, Relationship between transfer and impulse response, poles and zeros and restrictions, Network function for two terminal pair network, Sinusoidal network in terms of poles and zeros, Real liability condition for impedance synthesis of RL and RC circuits, Network synthesis techniques for 2-terminal network, Foster and Cauer forms.

Unit IV: Classification of filters, characteristics impedance and propagation constant of pure reactive network, Ladder network, T-section, π-section, terminating half section, Pass bands and stop bands, Design of constant-K, m-derived filters, Composite filters.

Suggested Readings/ Books:

- Bird John, *Electrical Circuit Theory and Technology*, 2nd Ed., Newnes.
- Chakraborty, Abhijit, *Circuit Theory*, 2nd Edition, Dhanpat Rai, 2001.
- Chaudhury D. Roy, *Networks and Synthesis*, New Age International.
- Edminister J.A., *Electric Circuits*, 4th Edition, Tata McGraw Hill, 2002.
- Iyer T.S.K.V., *Circuit Theory*, Tata McGraw Hill, 2006.
- Mohan, Sudhakar Sham, *Circuits and Networks Analysis and Synthesis*, 2nd Edition, Tata Mc Graw Hill, 2005.
- Van Valkenberg, M.E., *Network Analysis and Synthesis*, PHI learning, 2009.

BTEC303 Lab Analog Devices & Circuits

1. Study of Zener regulator as voltage regulator
2. Study of Half wave, full wave & Bridge rectifiers.
3. To plot the input and output characteristics of CE configuration.
4. To study the characteristics of a Class- A amplifier.
5. To study the characteristics of Class- B amplifier.
6. To study the characteristics of Class- B push-pull amplifier.
7. To study the characteristics of complementary symmetry amplifier.
8. To study the response of RC phase shift oscillator and determine frequency of oscillation.
9. To study the response of Hartley oscillator and determine frequency of oscillation.
10. To study the response of Colpitt's oscillator and determine frequency of oscillation.
11. To study the response of Wien Bridge oscillator and determine frequency of oscillation

BTEC-304 Lab Digital Circuit and Logic Design

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates; Realization of OR, AND, NOT and XOR functions using universal gates.
2. Realization Half Adder / Full Adder using Logic gates.
3. Realization Half Subtractor / Full Subtractor using Logic gates
4. Design 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter.
5. Design 4-Bit magnitude comparator using logic gates.Multiplexer: Truth-table verification and realization of Half adder and Full adder using MUX.
6. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor using DEMUX.
7. Flip Flops: Truth-table verification of RS, JK , D, JK Master Slave Flip Flops.

8. Design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops.
9. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations using IC7495 chip.

BTCS 309 Object Oriented Programming Using C++ Lab

1. **[Classes and Objects]** Write a program that uses a class where the member functions are defined inside a class.
2. **[Classes and Objects]** Write a program that uses a class where the member functions are defined outside a class.
3. **[Classes and Objects]** Write a program to demonstrate the use of static data members.
4. **[Classes and Objects]** Write a program to demonstrate the use of const data members.
5. **[Constructors and Destructors]** Write a program to demonstrate the use of zero argument and parameterized constructors.
6. **[Constructors and Destructors]** Write a program to demonstrate the use of dynamic constructor.
7. **[Constructors and Destructors]** Write a program to demonstrate the use of explicit constructor.
8. **[Initializer Lists]** Write a program to demonstrate the use of initializer list.
9. **[Operator Overloading]** Write a program to demonstrate the overloading of increment and decrement operators.
10. **[Operator Overloading]** Write a program to demonstrate the overloading of binary arithmetic operators.
11. **[Operator Overloading]** Write a program to demonstrate the overloading of memory management operators.
12. **[Typecasting]** Write a program to demonstrate the typecasting of basic type to class type.
13. **[Typecasting]** Write a program to demonstrate the typecasting of class type to basic type.
14. **[Typecasting]** Write a program to demonstrate the typecasting of class type to class type.
15. **[Inheritance]** Write a program to demonstrate the multilevel inheritance.
16. **[Inheritance]** Write a program to demonstrate the multiple inheritance.
17. **[Inheritance]** Write a program to demonstrate the virtual derivation of a class.
18. **[Polymorphism]** Write a program to demonstrate the runtime polymorphism.
19. **[Exception Handling]** Write a program to demonstrate the exception handling.
20. **[Templates and Generic Programming]** Write a program to demonstrate the use of function template.
21. **[Templates and Generic Programming]** Write a program to demonstrate the use of class template.

22. **[File Handling]** Write a program to copy the contents of a file to another file byte by byte. The name of the source file and destination file should be taken as command-line arguments,
23. **[File Handling]** Write a program to demonstrate the reading and writing of mixed type of data.

Fourth Semester

BTCS 304 Data Structures

Unit I Dynamic Memory Management: Understanding pointers, usage of pointers, arithmetic on pointers, memory allocation, memory management functions and operators, debugging pointers - dangling pointers, memory leaks, etc.

Unit II Introduction: Concept of data type, definition and brief description of various data structures, data structures versus data types, operations on data structures, algorithm complexity, Big O notation.

Unit III Arrays: Linear and multi-dimensional arrays and their representation, operations on arrays, sparse matrices and their storage.

Unit IV Linked List: Linear linked list, operations on linear linked list, doubly linked list, operations on doubly linked list, application of linked lists.

Unit V Stacks: Sequential and linked representations, operations on stacks, application of stacks such as parenthesis checker, evaluation of postfix expressions, conversion from infix to postfix representation, implementing recursive functions.

Unit VI Queues: Sequential representation of queue, linear queue, circular queue, operationson linear and circular queue, linked representation of a queue and operations on it, deque, priority queue, applications of queues.

Unit VII Trees: Basic terminology, sequential and linked representations of trees, traversing a binary tree using recursive and non-recursive procedures, inserting a node, deleting a node, brief introduction to threaded binary trees, AVL trees and B-trees.

Unit VIII Heaps: Representing a heap in memory, operations on heaps, application of heap in implementing priority queue and heap sort algorithm.

Unit IX Graphs: Basic terminology, representation of graphs (adjacency matrix, adjacency list), traversal of a graph(breadth-first search and depth-first search), and applications of graphs.

Unit X Hashing & Hash Tables: Comparing direct address tables with hash tables, hash functions, concept of collision and its resolution using open addressing and separate chaining, double hashing, rehashing.

Unit XI. Searching & Sorting: Searching an element using linear search and binary search techniques, Sorting arrays using bubble sort, selection sort, insertion sort, quick sort, merge sort, heap sort, shell sort and radix sort, complexities of searching & sorting algorithms.

Suggested Readings/ Books:

1. Sartaj Sahni, **Data Structures, Algorithms and Applications in C++,** Tata McGrawHill.

2. Tenenbaum, Augenstein, & Langsam, **Data Structures using C and C++**, Prentice Hall of India.

3. R. S. Salaria, **Data Structures & Algorithms Using C++,** Khanna Book Publishing Co. (P) Ltd.

4. Seymour Lipschutz, **Data Structures**, Schaum's Outline Series, Tata McGraw Hill

5. Kruse, **Data Structures & Program Design**, Prentice Hall of India.

6. R. S. Salaria, **Test Your Skills in Data Structures**

BTEE 402 Linear Control Systems

Unit I Introductory Concepts: Plant, Systems, Servomechanism, regulating systems, disturbances, Open loop control system, closed loop control systems, linear and non-linear systems, time variant and invariant, continuous and sampled-data control systems, Block diagrams, some illustrative examples.

Unit II Modeling: Formulation of equation of linear electrical, mechanical, thermal, pneumatic and hydraulic system, electrical, mechanical analogies. Transfer function, Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

Unit III Time Domain Analysis: Typical test – input signals, Transient response of the first and second order systems. Time domain specifications, Dominant closed loop poles of higher order systems. Steady state error and coefficients, pole-zero location and stability, Routh-Hurwitz Criterion.

Unit IV Root Locus Technique: The extreme points of the root loci for positive gain. Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain and sketch of the root locus plot.

Unit V Frequency Domain Analysis: Closed loop frequency response, Bode plots, stability and loop transfer function. Frequency response specifications, Relative stability, Relation between time and frequency response for second order systems. Log. Magnitude versus Phase angle plot, Nyquist criterion for stability.

Unit VI Compensation: Necessity of compensation, series and parallel compensation, compensating networks, applications of lag and lead-compensation.

Unit VII Control Components: Error detectors – potentiometers and synchros, servo motors, a.c. and d.c. techno generators, Magnetic amplifiers.

Suggested Readings / Books

- Dorf Richard C. and Bishop Robert H., *Modern Control System*, Addison –Wesley, Pearson New Delhi
- Ogata K., *Modern Control Engineering*", Prentice Hall,
- Kuo B. C., *Automatic Control System*", Prentice Hall
- Nagrath I.J. and Gopal M., *Control System Engineering*, Wiley Eastern Ltd.
- Singh / Janardhanan, Modern Control Engineering, Cengage Learning
- Kilian, Modern Control Technology: Components and Systems, Cengage Learning

BTEC 402 Signals & Systems

Unit I Classification of Signals and Systems: Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic & aperiodic, random &deterministic signals, Even& Odd Signals, Energy & Power Signals, Description of continuous time and discrete time systems.

Unit II Analysis of Continuous Time Signals: Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and its properties in Signal Analysis, Power Spectral Density and Energy spectral density.

Unit III Linear Time Invariant –Continuous Time Systems: Linear Time invariant Systems and their properties. Differential equation & Block diagram representation, Impulse response, Convolution integral, Frequency response (Transfer Function), Fourier transforms analysis.

Unit IV Analysis of Discrete Time Signals: Sampling of CT signals and aliasing, DTFT and its properties, Z- transform and properties of Z-transform.

Unit V Linear Time Invariant - Discrete Time System: Difference equations, Block diagram representation, Impulse response, Convolution sum, LTI systems analysis using DTFT and Z-transforms.

Unit VI Random Signal Theory: Introduction to probabilities, Definition, probability of Random events, Joint and conditional probability, probability Mass function statistical averages. Probability density functions and statistical averages. Examples of P.D. function, transformation of random variables random processes, stationary, True averages and Ergodic.

Suggested Readings / Books:

- Signals and Systems by Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Pearson Education.
- Fundamentals of Signals and Systems by Edward W Kamen & Bonnie's Heck, Pearson Education.
- Communication Signals & System by Simon Haykins, John Wiley & Sons.
- Signals and Systems by H P Hsu, Rakesh Ranjan, Schaum's Outlines, Tata McGraw Hill.
- Digital Signal Processing by S Salivahanan, A. Vallavaraj, C. Gnanapriya, McGraw Hill International.
- Signals and Systems by Simon Haykins and Barry Van Veen, John Wiley & sons, Inc.
- Signal, System & Transforms, Phillips, Pearson Education.
- Roberts, Signals & Linear Systems, by Robert A. Gabel and Richard A., John Wiley.
- Signals & systems, by Rodger E. Ziemer, William H. Tranter, D. Ronald Fannin. Pearson Education.

BTCS-404 Microprocessors and Assembly Language Programming

Unit I Introduction: Introduction to Microprocessors, history, classification, recent microprocessors.

Unit II Microprocessor Architecture: 8085 microprocessor Architecture. Bus structure, I/O, Memory & System buses, concept of address Bus, Data Bus & Control Bus, Synchronous & Asynchronous buses. Instruction execution sequence & Data Flow, Instruction cycle.

Unit III. I/O memory interface: Data transfer modes: Programmable, interrupt initiated and DMA. Serial & parallel interface, Detail study of 8251 I/O Processor & 8255 programmable peripheral interfaces.

Unit IV Instruction set & Assembly Languages Programming: Introduction, instruction & data formats, addressing modes, status flags, 8085 instructions, Data transfer operations, Arithmetic operations, Logical operations, Branch operations.

Unit V Case structure & Microprocessor application: Interfacing of keyboards and seven segment LED display, Microprocessor controlled temperature system (MCTS), Study of traffic light system, stepper motor controller, Microprocessor based micro computers.

Unit VI Basic architecture of higher order microprocessors: Basic introduction to 8086 family, Motorola 68000, Pentium processors.

Suggested Readings/ Books:

1. **8085 Microprocessor** by Ramesh Gaonkar, PHI Publications.
2. Daniel Tabak, **Advanced Microprocessors**, McGraw- Hill, Inc., Second Edition 1995.
3. Douglas V. Hall, **Microprocessors and Interfacing**: Programming and Hardware, Tata McGraw Hill Edition,

1986.

4. Charles M.Gilmore, **Microprocessors: Principles and Applications**, McGraw Hill.

BTEC-404 Electronics Measurements and Instrumentation

Unit I Fundamentals: Generalized instrumentation system – Units and Standards, Calibration Methods, Standards of measurements, Classification of errors, error analysis. Static Characteristics- Accuracy, Precision, sensitivity, linearity, resolution, hysteresis, threshold, input impedance, loading effects etc. Dynamic Characteristics.

Unit II Electronic Meters: Electronic Analog voltmeter: DC voltmeters-Choppers type- DC amplifier, solid state voltmeter, Differential voltmeter, peak responding voltmeter, True RMS voltmeter, calibration of DC voltmeters. Digital Voltmeter:- Introduction, Ramp Techniques, dual slope, integrating type DVM, Successive approximation type DVM, Resolution and sensitivity of digital meters, general specification of a DVM. CRO's,study of various stages in brief, measurement of voltage, current phase and frequency, special purpose oscilloscope.

Unit III Measuring Instruments: Principle of operation of galvanometer, PMMC, Moving Iron instruments, Resistance measurements using Wheatstone bridge, Kelvin Double Bridge, Ohm meter, AC bridges: Maxwell bridge, Maxwell wein bridge, Hey's Bridge, Schering Bridge, Anderson Bridge, Campbell Bridge.

Unit IV Instrumentation for Generation and Analysis of Waveforms: Signal generators: Fixed and variable AF oscillators, AF sine and square wave generator, Function generator: Square and pulse generator, Sweep generator, wave analyzer, harmonic distortion analyzer, spectrum analyzer, spectrum analysis.

Unit V Storage and Display Devices: Necessity of recorders, recording requirements, graphic recorders, strip chart recorders, magnetic tape recorders, digital tape recorders. Electronic indicating instruments, seven segment display, fourteen segmental display Nixie tube.

Unit VI Transducers and DATA Acquisition Systems: Strain gauge, LVDT, thermocouple, piezoelectric, crystal and photoelectric transducers and their applications. Data acquisition systems.

Unit VII Telemetry: Introduction, method of data transmission, types of telemetry systems and applications.

Suggested Readings / Books:

- Electrical and Electronic Measurements and Instrumentation, by K.
- SAWHNEY. Electronic Instrumentation and Measurement Techniques, by D
- Cooper. Electronic Instrumentation, by H.S. Kalsi, Tata McGraw Hill
- Applied Electronics Instrumentation and measurement, David Buchla, Wayne Melachlan:
- Electronics Measurement and Instrumentation,Oliver by B.H and Cag J.M. McGrawHill.
- Element of Electronic Instrumentation & Measurment, by Carr, Pearson Education.
- Electronic Measurments & Instrumentation, by Kishore, Pearson Education.
- Process Control Systems and Instrumentation, Bartelt, Cengage Learning

BTEL-401 Numerical Methods

Unit I. Errors in Numerical Calculations
Errors and their analysis, general error formula, errors in a series approximation
Unit II Solution of algebraic and Transcendental equations: Bisection method, iteration method, Method of false position,, Newton -Raphson method, solution of systems of non linear equations, method of iteration
Unit III. Interpolation method:
Errors in polynomial interpretation, finite difference , forward, backward and central difference, Difference of a polynomial, Newtons formulae for interpolation, central difference intepolation formulae, Interpolation with unevenly spaced points, Newton's general interpolation formula, interpolation by iteration
Unit IV Curve Fitting:
Cubic splines and approximation:introduction, Least square curve fitting,,Procedures -fitting a straight line, non linear curve fitting, curve fitting by a sum of exponentials, Data fitting with cubic splines-derivation of governing equation, end conditions
Unit V Numericl Differentiation and Integration
Numerical differentiation- cubic spline method: maximum and minimum values of a tabulated function; Numerical Integration- trapezoidal rule, Simpson1/3 rule, Simpsons 3/8 rule, Newton-cots integration formulae; Euler-Meclaurin formula, Gaussian integration(One dimensional only)
Unit VI. Matrices and Linear systems of equations
Introduction, Inverse of Matrix, Solution of linear systems, Matrix inversion method, Gaussian Elimination method(fall and banded symmetric and unsymmetric systems), Eigen value problems
Unit VII. Numerical solution of ordinary differential equations:
Solution by Taylor's series, Prediction -correction method, Boundary value problems, Prediction corrector method, Euler's and modified Euler's method, Runge-Kutta method, finite difference methods

Suggested Books:
1. Computer Oriented Numerical Methods- V. RajaRaman
2. Numerical Methods in Fortran -Mc Cromik and Salavadory
3. Elementary Numerical Analysis, S.D. Conte, & Cari De Boor. Mc Graw Hill.
4.Applied Numerical Methods, Cornahn B., Et al, John Wiley.

BTCS-408 Microprocessor and Assembly Language Programming Lab

1. Introduction to 8085 kit.

2. Addition of two 8 bit numbers, sum 8 bit.

3. Subtraction of two 8 bit numbers.

4. Find 1's complement of 8 bit number.

5. Find 2's complement of 8 bit number.

6. Shift an 8 bit no. by one bit.

7. Find Largest of two 8 bit numbers.

8. Find Largest among an array of ten numbers (8 bit).

9. Sum of series of 8 bit numbers.

10. Introduction to 8086 kit.

11. Addition of two 16 bit numbers, sum 16 bit.

12. Subtraction of two 16 bit numbers.

13. Find 1's complement of 16 bit number.

14. Find 2's complement of 16 bit number.

References:

Microprocessor by B. Ram, Dhanpat Rai Publications.

BTCS306 Data Structures Lab

List of practical exercises, to be implemented using object-oriented approach in C++ Language.

1. Write a menu driven program that implements following operations (using separate functions) on a linear array:

- Insert a new element at end as well as at a given position
- Delete an element from a given whose value is given or whose position is given
- To find the location of a given element
- To display the elements of the linear array

2. Write a menu driven program that maintains a linear linked list whose elements are stored in on ascending order and implements the following operations (using separate functions):

- Insert a new element
- Delete an existing
- Search an element
- Display all the elements

3. Write a program to demonstrate the use of stack (implemented using linear array) in converting arithmetic expression from infix notation to postfix notation.
4. Program to demonstrate the use of stack (implemented using linear linked lists) in evaluating arithmetic expression in postfix notation.
5. Program to demonstration the implementation of various operations on a linear queue represented using a linear array.
6. Program to demonstration the implementation of various operations on a circular queue represented using a linear array.
7. Program to demonstration the implementation of various operations on a queue represented using a linear linked list (linked queue).
8. Program to illustrate the implementation of different operations on a binary search tree.
9. Program to illustrate the traversal of graph using breadth-first search.
10. Program to illustrate the traversal of graph using depth-first search.
11. Program to sort an array of integers in ascending order using bubble sort.
12. Program to sort an array of integers in ascending order using selection sort.
13. Program to sort an array of integers in ascending order using insertion sort.

14. Program to sort an array of integers in ascending order using radix sort.

15. Program to sort an array of integers in ascending order using merge sort.

16. Program to sort an array of integers in ascending order using quick sort.

17. Program to sort an array of integers in ascending order using heap sort.

18. Program to sort an array of integers in ascending order using shell sort.

19. Program to demonstrate the use of linear search to search a given element in an array.

20. Program to demonstrate the use of binary search to search a given element in a sorted array in ascending order.

BTEL-402 Numerical Methods

1. To develop computer program to determine roots of a given equation using method of
a. False position
b. Newton -Raphson method,
2. To develop computer programs for solution of system of simultaneous linear equations using:
a. Gauss Elimination Technique, without and with specified boundary conditions, for
full as well as bounded symmetric and unsymmetrical matrices
b. Gauss Shield iterative technique Successive over Relaxation(S.O.R) Technique

3. Linear and Non-Linear curve fitting technique

4. Numerical Integration with Simpson's rule and Gaussian Integration

5. Solution of ordinary differential equations by (i) Eular Method (ii) Runge-Kutta Method (iii) Taylor Series Methods
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