BHAGWANT UNIVERSITY
ELECTRICAL ENGG (POWER SYSTEM).
M.Tech Integrated Course

SEMESTER III

THEORY/ PRACTICALS AND SESSIONALS

S.NO.	CODE NO.	SUBJECT	TEACHING PERIODS			CREDIT
			L	T	P	
1.	03IEE101	Mathematics-III	3	1	0	4
2.	03IEE102	Object Oriented Programming using. C++	3	1	0	4
3.	03IEE103	Circuit Analysis & synthesis	3	1	0	4
4.	03IEE104	Electronics devices &Circuits	3	1	0	4
5.	03IEE105	Electrical & Electronics measurement	3	0	0	3
6.	03IEE106	Data structure and Algorithm	3	0	0	3
7.	03IEE201	Computer Programming Lab	0	0	2	1
8.	03IEE202	Circuit Analysis Lab	0	0	3	2
9.	03IEE203	Electronics Devices & Circuits Lab	0	0	3	2
10.	03IEE204	Electrical & Electronics measurement lab	0	0	3	2
11.	03IEE301	Discipline/Extra-Curricular Activities	0	0	4	1
		TOTAL	18	4	12	30

SEMESTER IV

THEORY/ PRACTICALS AND SESSIONALS

S.No.	Code No.	Subject	Teaching Periods			Credit Points
			L	T	P	
1.	04IEE101	Electrical Machines-I	3	1	0	4
2.	04IEE102	Digital Electronics	3	1	0	4
3.	04IEE103	Electrical Engg. Materials	3	1	0	4
4.	04IEE104	Applied Electronics	3	1	0	4
5.	04IEE105	Linear Integrated circuits	3	0	0	3
6.	04IEE106	Electromagnetic Field Theory	3	0	0	3
7.	04IEE201	Electrical Machines Lab-I	0	0	3	2
8.	04IEE202	Digital Electronics Lab	0	0	3	2
9.	04IEE203	Applied Electronics Lab	0	0	3	2
10.	04IEE204	Integrated circuit Lab	0		3	2
11.	04IEE301	DISCIPLINE & CO CURRICULAR ACTIVITIES	0	0	4	1
		Total	18	4	9	31

SEMESTER V

THEORY/ PRACTICALS AND SESSIONALS

S. No.	Code No.	Subject	Teaching Periods			Credit Points
			L	T	. P	
1.	05IEE101	Power Electronics	3	1	0	4
2.	05IEE102	Electrical machines -II	3	1	0	4
3.	05IEE103	Control Systems	3	0	0	3
4.	05IEE104	Analog Communication	3	0	0	3
5.	05IEE105	Trans. and Distri. of Elect. Power	3	0	0	3
6.	05IEE106	Object Oriented Programming Using JAVA	3	0	0	3
7.	05IEE201	Power Electronics Lab	0	0	3	2
8.	05IEE202	Electrical Machines Lab - II	0	0	3	2
9.	05IEE203	Control System Lab	0	0	3	2
10.	05IEE204	Power System Design Lab	0	0	3	2
11	**05IEE205**	**Entrepreneurship Development**	**0**	**0**	**2**	**1**
11.	05IEE301	Discipline/Extra-Curricular Activities	0	0	4	1
		Total	18	2	10	30

SEMESTER VI

THEORY/ PRACTICALS AND SESSIONALS

S. No.	Code No.	Subject	Teaching Periods			Credit Points
			L	T	. P	
1.	06IEE101	Modern Control Theory	3	1	0	4
2.	06IEE102	Microprocessor & Microcontroller	3	1	0	4
3.	06IEE103	Protection of Power System	3	1	0	4
4.	06IEE104	Advanced Power Electronics	3	0	0	3
5.	06IEE105	Data Structures in C	3	0	0	3
6.	06IEE106	Digital Communication & Info. Theory	3	0	0	3
7.	06IEE201	Microprocessor Lab	0	0	3	2
8.	06IEE202	Power System Lab	0	0	3	2
9.	06IEE203	MATLAB Programming Lab	0	0	3	2
10.	06IEE204	Advanced Power Electronics Lab	0	0	3	2
11.	06IEE301	DISCIPLINE & CO CURRICULAR ACTIVITIES	0	0	4	1
		Total	18	3	9	30

SEMESTER VII

THEORY/ PRACTICALS AND SESSIONALS

S.No.	Code No.	Subject	TEACHING PERIOD L	T	P	Credit Points
1.	07IEE101	Database Management Systems	3	0	0	3
2.	07IEE102	Power System Analysis	3	1	0	4
3.	07IEE103	Artificial Intelligence Techniques	3	1	0	4
4.	07IEE104	Utilization of Electrical Power	3	1	0	4
5.	07IEE105	Power System Engineering	3	0	0	3
6.	07IEE106	Digital signal processing	3	0	0	3
7.	07IEE201	DBMS Lab	0	0	3	2
8.	07IEE202	POWER SYSTEM MODELLING & SIM. LAB-I	0	0	3	2
9.	07IEE203	DIGITAL SIGNAL PROCESSING LAB-I	0	0	3	2
10	07IEE204	PRACTICAL TRAINING & INDUSTRIAL VISIT	0	0	3	2
11	07IEE301	DISCIPLINE & CO CURRICULAR ACTIVITIES	0	0	4	1
			18	3	9	30

SEMESTER VIII
THEORY/ PRACTICALS AND SESSIONALS

S. No.	Code No.	Subject	TEACHING PERIOD L	T	P	Credit Points
1.	08IEE101	EHV AC/DC Transmission	3	1	0	4
2.	08IEE102	Electric Drives & their Control	3	1	0	4
3.	08IEE103	Switch Gear & Protection	3	1	0	4
4	08IEE104	Non Conventional Energy Sources	3	1	0	4
5	08IEE105/ 01MPS103	POWER SYSTEM ANALYSIS	3	0	0	3
6	08IEE106/ 02MPS104	OPERATION & CONTROL OF POWER SYSTEM	3	0	0	3
7	08IEE201	Industrial Economic & Management	0	0	3	2
8	08IEE202	Electrical Drives & Control Lab	0	0	3	2
9	08IEE203	DIGITAL SIGNAL PROCESSING LAB-II	0	0	3	2
10	08IEE204	PROJECT STAGE-I	0	0	2	1
11	08IEE301	DISCIPLINE & CO CURRICULAR ACTIVITIES	0	0	4	1
			18	4	8	30

SEMESTER IX
THEORY/ PRACTICALS AND SESSIONALS

S. No.	Code No.	Subject	TEACHING PERIOD L	T	P	Credit Points
1.	09IEE101/ 03MPS101	FLEXIBLE AC TRANSMISSION SYSTEM	3	1	0	4
2.	09IEE102/ 03MPS102	EXCITATION OF SYNCHRONOUS MACHINE & THEIR CONTROL	3	1	0	4
3.	09IEE201/ 02MPS201	POWER SYSTEM MODELING & SIMULATION LAB	0	0	5	5
4	09IEE202	DISSERTATION STAGE-1	0	0	5	5
5	09IEE301	DISCIPLINE & CO CURRICULAR ACTIVITIES	0	0	4	1
		TOTAL	6	2	11	19

SEMESTER X

THEORY/ PRACTICALS AND SESSIONALS

S. No.	Code No.	Subject	TEACHING PERIOD L	T	P	Credit Points
1.	10IEE201	SEMINAR	0	0	5	5
2.	10IEE202	DISSERTATION STAGE-2				
		1. CONTINOUS EVALUATION	5	0	0	5
		2. PROJECT REPORT	5	0	0	5
		3. VIVA VOICE	6	0	0	6
3.	10IEE301	DISCIPLINE & CO CURRICULAR ACTIVITIES	0	0	4	1
		TOTAL	16	0	6	22

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III-SEMESTER

03IEE101 MATHEMATICS-III

Unit-1 **LAPLACE TRANSFORM:** Laplace transform with its simple properties, applications to the Solution of ordinary and partial differential equations having constant coefficients with special reference to wave and diffusion equations, digital transforms.

Unit-2 **FOURIER TRANSFORM**: Discrete Fourier transform, Fast Fourier transform, Complex form of Fourier transform and its inverse applications, Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation.

Unit-3 **FOURIER SERIES:** Expansion of simple functions in Fourier series, half range series, changes of interval, harmonic analysis. **CALCULUS OF VARIATION:** Functional, strong and weak variations, simple variation problems, Euler's equation

Unit-4 **COMPLEX VARIABLES:** Analytic functions, Cauchy-Riemann equations, Elementary conformal mapping with simple applications, Line integral in complex domain, Cauchy's theorem, Cauchy's integral formula.

Unit-5 **COMPLEX VARIABLES:** Taylor's series, Laurent's series, poles, Residues. Evaluations of simple definite real integrals using the theorem of residues. Simple contour integration.

03IEE102 OBJECT ORIENTED PROGRAMMING USING C++

Unit-1 **PROGRAMMING IN C:** Review of basics of C. structure & pointer type. Variables. Singly and doubly linked lists. I/O and text file handling. Command line arguments.

Unit-2 **OOP FUNDAMENTALS:** Concept of class and object. Attributes, public, private and protected members. Derived classes. Single & multiple inheritances.

Unit-3 **PROGRAMMING IN C++:** Enhancements in C++ over C in data types, operators and functions. Inline functions, constructors and destructors. Friend function. Function and operator overloading.

Unit-4 Working with class and derived classes. Single and. multiple and multilevel inheritances and their combinations. Virtual functions, pointers to objects.

Unit-5 Working with text files. Templates. File handling in C++, Input output flags and formatting operations.

03IEE103 CIRCUIT ANALYSIS & SYNTHESIS

Unit-1 **NETWORK THEOREMS AND ELEMENTS: Thevenin's**, Norton's, Reciprocity, Superposition, Compensation, Miller's, Tellegen's and maximum power transfer theorems. Networks with dependent sources. Inductively coupled circuits -

mutual inductance, coefficient of coupling and mutual inductance between portions of same circuits and between parallel branches. Transformer equivalent, inductively and conductively coupled circuits.

Unit-2 **TRANSIENT ANALYSIS:** Impulse, step, ramp and sinusoidal response Analysis of first order and second order circuits. Time domain & transform domain (frequency, Laplace) analysis. Initial and final value theorems. Complex periodic waves and their analysis by Fourier analysis. Different kind of symmetry. Power in a circuit.

Unit-3 **NETWORK FUNCTIONS:** Terminals and terminal pairs, driving point impedance transfer functions, poles and zeros. Procedure of finding network functions for general two terminal pair networks. Stability & causality

Unit-4 **TWO PORT NETWORKS:** Two port parameters and their interrelations - z-parameters, y - parameters, h-parameters, ABCD parameters. Equivalence of two ports, transformer equivalent, interconnection of two port networks. Image parameters. Attenuation & phase shift in symmetrical T and Π Networks.

Unit-5 **NETWORK SYNTHESIS:** Hurwitz polynomial, positive real function, reactive networks. Separation property for reactive networks. The four-reactance function forms, specification for reactance function. Foster form of reactance networks. Cauer form of reactance networks. Synthesis of R-L and R-C networks in Foster and Cauer forms.

03IEE104 ELECTRONIC DEVICES & CIRCUITS

Unit-1 **SEMICONDUCTOR PHYSICS :** Mobility and conductivity, charge densities in a semiconductor, Fermi Dirac distribution, carrier concentrations and fermi levels in semiconductor, Generation and recombination of charges, diffusion and continuity equation, Mass action Law, Hall effect.

Unit-2 Junction diodes, Diode as a circuit element, load line concept, clipping and clamping circuits, Voltage multipliers. Construction, characteristics and working principles of UJT

Unit-3 Transistor characteristics, Current components, Current gains: alpha and beta. Operating point. Hybrid model, h-parameter equivalent circuits. CE, CB and CC configuration. DC and AC analysis of CE, CC and CB amplifiers. Ebers-Moll model. Biasing & stabilization techniques. Thermal runaway, Thermal stability.

Unit-4 JFET, MOSFET, Equivalent circuits and biasing of JFET's & MOSFET's. Low frequency CS and CD JFET amplifiers. FET as a voltage variable resistor.

Unit-5 **SMALL SIGNAL AMPLIFIERS AT LOW FREQUENCY:** Analysis of BJT and FET, DC and RC coupled amplifiers. Frequency response, midband gain, gains at low and high frequency. Analysis of DC and differential amplifiers, Miller's Theorem. Cascading Transistor amplifiers, Darlington pair. Emitter follower, source follower.

03IEE105 ELECTRICAL & ELECTRONIC MEASUREMENTS

Unit-1 **THEORY OF ERRORS:** Accuracy & precision, Repeatability, Limits of errors, Systematic & random errors Modeling of errors, Probable error & standard deviation, Gaussian error analysis, Combination of errors.

Unit-2 **ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS:**

Electronic Voltmeter, Electronic Multimeters, Digital Voltmeter, Component Measuring

Instruments, Q meter, Vector Impedance meter, RF Power & Voltage Measurements. Measurement of frequency. Introduction to shielding & grounding.

Unit-3 **OSCILLOSCOPES:** CRT Construction, Basic CRO circuits, CRO Probes, Oscilloscope Techniques of Measurement of frequency, Phase Angle and Time Delay, Multibeam, multi trace, storage& sampling Oscilloscopes. Curve tracers. Diaphragms, Seismic Accelerometers, Tachogenerators, Load Cell, Piezoelectric Transducers, Ultrasonic Flow Meters.

Unit-4 **SIGNAL GENERATION:** Sine wave generators, Frequency synthesized signal generators, Sweep frequency generators. Signal Analysis - Measurement Technique, Wave Analyzers, and Frequency - selective wave analyzer, heterodyne wave analyzer, Harmonic distortion analyzer, and Spectrum analyzer.

Unit-5 **TRANSDUCERS:** Classification, Selection Criteria, Characteristics, Construction, Working Principles, Application of following Transducers- RTD, Thermocouples, Thermistors, LVDT, RVDT, Strain Gauges, Bourdon Tubes, Bellows. Diaphragms, Seismic Accelerometers, Tachogenerators, Load Cell, Piezoelectric Transducers, Ultrasonic Flow Meters

03IEE106 DATA STRUCTURES & ALGORITHMS

Unit-1 **Data Structure:** Definition, Implementation, Operation, Application, Algorithm writing and convention, Analysis of algorithm, Complexity Measures and Notations. Arrays: Representation of arrays (multidimensional), Address calculation using column and row major ordering. Linked Lists : Implementation, Doubly linked list, Circular linked list, unrolled linked list, skip-lists, Splices, Sentinel nodes, Application (Sparse Matrix, Associative Array, Functional Programming

Unit-2 **Stacks**: Definition, Implementation, Application (Tower of Hanoi, Function Call and return, Parentheses Matching, Back-tracking, and Expression Evaluation) Queues: Definition, deque, enque, priority queue, bounded queue, Implementation, Application

Unit-3 **Tree:** Definition of elements, Binary *trees:* Types (Full, Complete, Almost complete), Binary Search Tree, Traversal (Pre, In, Post & Level order), Pruning, Grafting. Application: Arithmetic Expressions Evaluation Variations: Indexed Binary Tree, Threaded Binary Tree, AVL tree, Multi-way trees, B tree, B+ tree, Forest, Trie and Dictionary

Unit-4 **Graphs:** Elementary definition, Representation (Adjacency Matrix, Adjacency Lists) Traversal (BFS, DFS Application: Spanning Tree (Prim and Kruskal Algorithm), Dijkstra's algorithm, and shortest path algorithms.

Unit-5 **Sorting:** Bubble, Selection, Insertion, Quick, Radix, Merge, Bucket, Heap, Searching: Hashing, Symbol Table, Binary Search, Simple String Searching

03IEE201 COMPUTER PROGRAMMING-I

1 Write a program to find the greatest between four numbers.
2 Write a program to prepare mark sheet of students using structure and class.
3 Write a C program to read several different names and addresses. re-arrange the names in alphabetical order and print name in alphabetical order using structures and class.
4 Write a program to implement concatenation of two strings using pointers.
5 Write a program to perform the complex arithmetic.
6 Write a program to perform the rational number arithmetic.

7 Write a program to perform the matrix operations. (Transpose, Subtraction , addition. multiplication, Test if a matrix is symmetric/lower triangular/ upper triangular)
8 Implement Morse code to text conversion and vice-versa.
9 To calculate Greatest Common Divisor of given numbers.
10 To implement tower of Hanoi problem.
11 Write a program to create a singly link list often students names and implement add node, delete node and isemptylist operations.
12 Write a program to search a pattern in a given string.
13 Write a Program to read add, subtract and multiply integer matrices.
14 Write a program to calculate the power function (m") using the function overloading technique; implement it for power of integer and double.
15 Implement file creation and operate it in different modes: seek, tell, read, write and close operations.
16 Using multiple inheritance, prepare students' mark sheet. Three classes containing marks for every student in three subjects. The inherited class generate mark sheet.

03IEE202 CIRCUIT ANALYSIS LAB

1 Verification of principle of superposition with dc and ac Sources.
2 Verification of Thevenin, Norton's theorems in ac circuits.
3 Verification of Maximum power transfer theorem.
4 Determination of transient response of Current in RL and RC circuits with step voltage input .
5 Determination of transient response of current in RLC circuit with step voltage input for under damp, critically damp and over damp cases.
6 Determination of frequency response of current in RLC circuit with sinusoidal ac input.
7 Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters.
8 Determination of driving point and transfer functions of a two-port ladder network and verify Y with theoretical values.

03IEE203 ELECTRONICS DEVICES & CIRCUITS LAB

1 Study the following devices:
(a) Analog & digital multimeters (b) Function/ Signal generators (c) Regulated d. c. power supplies (constant voltage and constant current operations) (d) Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.
2 Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse Saturation current and static & dynamic resistances.
3 Plot V-I characteristic of zener diode and study of zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
4 Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.
5 Plot drain current - drain voltage and drain current - gate bias characteristics of field effect transistor and measure of Idss & Vp
6 Application of Diode as clipper & clamper

7 Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.
8 Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.
9 Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h parameters.
10 Study half wave rectifier and effect of filters on wave. Also calculate theoretical & practical ripple factor.
11 Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor.

03IEE204 ELECTRICAL AND ELECTRONICS MEASUREMENT LAB
1 Measure earth resistance using fall of potential method.
2 Plot V-I characteristics & measure open circuit voltage & short circuit current of a solar panel.
3 Measure unknown inductance capacitance resistance using following bridges (a) Anderson Bridge (b) Maxwell Bridge
4 To measure unknown frequency & capacitance using Wein's bridge.
5 Measurement of the distance with the help of ultrasonic transmitter & receiver.
6 Measurement of displacement with the help of LVDT.
7 Draw the characteristics of the following temperature transducers: (a) RTD (Pt-100) (b) Thermistors (c) Thermocouple
8 Draw the characteristics between temperature & voltage of a K type thermocouple
9 Measure the speed of a Table Fan using stroboscope.
10 Measurement of strain/ force with the help of strain gauge load cell.
11 Study the working of Q-meter and measure Q of coils.
12 To study the working of Spectrum analyzer and determine the bandwidth of different signals.

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IV-SEMESTER

04IEE101 ELECTRICAL MACHINES-I
Unit-1 **ELECTROMECHANICAL ENERGY CONVERSION:** Basic principles of Electromechanical energy conversion. Basic aspects and physical phenomena involved in energy conversion. Energy balance.
Unit-2 **DC GENERATORS**: Construction, Types of DC generators, emf equation, lap & wave windings, equalizing connections, armature reaction, commutation, methods of improving commutations, demagnetizing and cross magnetizing mmf, interpoles, characteristics, parallel operation. Rosenberg generator.
Unit-3 **DC MOTORS:** Principle, back emf, types, production of torque, armature reaction & interpoles, characteristics of shunt, series & compound motor, DC motor starting. Speed Control of DC Motor: Armature voltage and field current control

methods, Ward Leonard method. Braking, losses and efficiency, direct & indirect test, Swinburne's test, Hopkinsion test, field & retardation test, single-phase series motor.
Unit-4 **TRANSFORMERS:** Construction, types, emf equation. No load and load conditions. Equivalent circuits, Vector diagrams, OC and SC tests, Sumpner's back-to-back test, efficiency. Voltage regulation, effect of frequency, parallel operation, autotransformers, switching currents in transformers, separation of losses.
Unit-5 **POLYPHASE TRANSFORMERS**: Single unit or bank of single-phase units, polyphase connections, Open delta and V connections, Phase conversion: 3 to 6 phase and 3 to 2 phase conversions, Effect of 3-phase winding connections on harmonics, 3-phase winding transformers, tertiary winding.

04IEE102 DIGITAL ELECTRONICS
Unit-1 **NUMBER SYSTEMS, BASIC LOGIC GATES & BOOLEAN ALGEBRA:** Binary Arithmetic & Radix representation of different numbers. Sign & magnitude representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function. Derived logic gates: Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and vica-versa. Converting logic diagrams to universal logic. Positive, negative and mixed logic. Logic gate conversion.
Unit-2 **DIGITAL LOGIC GATE CHARACTERISTICS:** TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, CMOS & MOSFET. Interfacing logic families to one another.
Unit-3 **MINIMIZATION TECHNIQUES:** Minterm, Maxterm, Karnaugh Map, K map upto 4 variables. Simplification of logic functions with K-map, conversion of truth tables in POS and SOP form. Incomplete specified functions. Variable mapping. Quinn-Mc Klusky minimization techniques.
Unit-4 **COMBINATIONAL SYSTEMS:** Combinational logic circuit design, half and full adder, subtractor. Binary serial and parallel adders. BCD adder. Binary multiplier. Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder. Multiplexer, demultiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode switching matrix. Design of logic circuits by multiplexers, encoders, decoders and demultiplexers.
Unit-5 **SEQUENTIAL SYSTEMS:** Latches, flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops. Counters: Asynchronous (ripple), synchronous and synchronous decade counter, Modulus counter, skipping state counter, counter design. Ring counter. Counter applications. Registers: buffer register, shift register.

04IEE103 ELECTRICAL ENGINEERING MATERIALS
Unit-1 **DIELECTRIC MATERIALS:** Polarization phenomenon, spontaneous polarization, dielectric constant and loss, piezo and Ferro electricity application.
Unit-2 **MAGNETIC MATERIALS:** Dia, Para, ferro- ferrimagnetisms; soft and hard magnetic materials and their applications.

Unit-3 **SEMI CONDUCTOR MATERIALS:** Crystal growth, zone refining, Degenerate and no degenerate semiconductors, Direct and indirect band gap semiconductors. Electronic properties
of silicon, Germanium, Compound Semiconductor, Gallium Arsenide, gallium phosphide & Silicon carbide.
Unit-4 **CONDUCTIVE & SUPERCONDUCTIVE MATERIALS:** Electrical properties of conductive and resistive materials. Important characteristics and electronic applications of specific conductor & resistance materials. Superconductor phenomenon, Type I and Type II superconductors and their applications.
Unit-5 **PASSIVE COMPONENETS & PCB FABRICATION:** Brief study of fabrication methods of fixed and variable type of resistors; capacitors, Inductors, solenoid and toroid, air core, iron core and Ferro core conductors. Printed Circuit Boards - Types, Manufacturing of copper clad laminates, PCB Manufacturing process, Manufacturing of single and double sided PCBs. Surface mount devices - advantages & limitations.

04IEE104 APPLIED ELECTRONICS
Unit-1 **FEEDBACK AMPLIFIERS:** Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers. Analysis of voltage-series, voltageshunt, current-series and current-shunt feedback amplifier, Stability criterion.
Unit-2 **OSCILLATORS:** Classification, Criterion for oscillation. Tuned collector, Hartley, Colpitts, RC-Phase shift, Wien bridge and crystal oscillators, Astable, monostable and bistable multivibrators. Schmitt trigger. Blocking oscillators.
Unit-3 **HIGH FREQUENCY AMPLIFIERS:** Hybrid pie model, conductances and capacitances of hybrid-pie model, high frequency analysis of CE amplifier, gain-bandwidth product. Emitter follower at high frequencies.
Unit-4 **DIGITAL LOGIC GATE CHARACTERISTICS:** TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry, Open collector TTL. Three state output logic. TTL subfamilies, MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, CMOS & COMS logic families. Realization of logic gates in RTI, DTI, ECL, CMOSFET. Interfacing logic families to one another.
Unit-5 **POWER AMPLIFIERS:** Power amplifier circuits, Class A output stages, class B output stage and class AB output stages class C amplifiers, pushpull amplifiers with and without transformers. Complementary symmetry & quasi complementary symmetry amplifiers

04IEE105LINEAR INTEGRATED CIRCUITS
Unit-1 **OPERATIONAL AMPLIFIERS**: Basic differential amplifier analysis, Single ended and double ended configurations, Op-amp configurations with feedback, Op-amp parameters, Inverting and Non-Inverting configuration, Comparators, Adder**.**
Unit-2 **OPERATIONAL AMPLIFIER APPLICATIONS:** Integrator, Differentiator, Voltage to frequency & Frequency to voltage converters. Oscillators: Phase shift, Wien bridge, Quadrature, square wave, triangular wave, saw tooth oscillators. Voltage controlled oscillators.
Unit-3 **ACTIVE FILTERS:** Low pass, high pass, band pass and band reject filters, All pass filter, Switched capacitor filter, Butterworth filter design, Chebyshev Filter design.

Unit-4 **PHASE-LOCKED LOOPS**: Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, Frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM565 PLL.
Unit-5 **LINEAR IC's**: Four quadrant multiplier & its applications, Basic blocks of linear IC voltage regulators, Three terminal voltage regulators, Positive and negative voltage regulators. The 555 timer as astable and monostable multivibrators. Zero crossing detector, Schmitt trigger.

04IEE106 ELECTROMAGNETIC FIELD THEORY

Unit-1 **INTRODUCTION:** Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinates system. Concept and physical interpretation of gradient, Divergence and curl, Green's & Stoke's theorems.
Unit-2 **ELECTROSTATICS:** Electric field intensity & flux density. Electric field due to various charge configurations. The potential functions and displacement vector. Gauss's law. Poisson's and Laplace's equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy. Field determination by method of images. Boundary conditions. Field mapping and concept of field cells.
Unit-3 **MAGNETOSTATICS :** Magnetic field intensity, flux density & magnetization, Faraday's Law, Bio-Savart's law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance, Energy stored in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field mapping and concept of field cells.
Unit-4 **TIME VARYING FIELDS:** Displacement currents and equation of continuity. Maxwell's equations, Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflection & refraction of Uniform Plane Wave, standing wave ratio. Pointing vector and power considerations.
Unit-5 **RADIATION, EMI AND EMC:** Retarded Potentials and concepts of radiation, Radiation from a small current element. Radiation resistance**:** Introduction to Electromagnetic Interference and Electromagnetic compatibility, EMI coupling modes, Methods of eliminating interference, shielding, grounding, conducted EMI, EMI testing: emission testing, susceptibility testing.

04IEE201 ELECTRICAL MACHINES LAB-I

1 Speed control of D.C. shunt motor by (a) Field current control method & plot the curve for speed vs field current. (b) Armature voltage control method & plot the curve for speed vs armature voltage.
2 Speed control of a D.C. Motor by Ward Leonard method and to plot the curve for speed vs applied armature voltage.
3 To determine the efficiency of D.C. Shunt motor by loss summation (Swinburne's) method.
4 To determine the efficiency of two identical D.C. Machine by Hopkinson's regenerative test.
5 To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.
6 To perform back-to-back test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit.

7 To perform parallel operation of two 1-phase transformers and determine their load sharing.
8 To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.
9 To perform OC & SC test on a 3-phase transformer & find its efficiency and parameters of its equivalent circuit.
10 To perform parallel operation of two 3-phase transformers and determine their load sharing.
11 To study the performance of 3-phase transformer for its various connections, i.e. star/star star/delta delta/star and delta/delta and find the magnitude of 3rd harmonic current.

04IEE202 DIGITAL ELECTORNICS LAB

1. To study and perform the following experiments.
(a) Operation of digital multiplexer and demultiplexer. (b) Binary to decimal encoder.
(c) Characteristics of CMOS integrated circuits.
2 To study and perform experiment- Compound logic functions and various combinational circuits
based on AND/NAND and OR/NOR Logic blocks.
3 To study and perform experiment -Digital to analog and analog to digital converters.
4 To study and perform experiment- Various types of counters and shift registers.
5 To study and perform experiment - Interfacing of CMOS to TTL and TTL to CMOS ICs.
6 To study and perform experiment- BCD to binary conversion on digital IC trainer.
7 To study and perform experiment -
(a) Astable (b) Monostable (c) Bistable Multivibrators and the frequency variation with different
parameters, observe voltage waveforms at different points of transistor.
8 To study and perform experiment -Voltage comparator circuit using IC-710.
9 To study and perform experiment- Schmitt transistor binary circuit.
10 Design 2 bit binary up/down binary counter on bread board.

04IEE203 APPLIED ELECTRONICS LAB

1 Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.
2 Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor.
3 Plot and study the characteristics of small signal amplifier using FET.
4 Study of push pull amplifier. Measure variation of output power & distortion with load.
5 Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency.
6 Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
7 Study the following oscillators and observe the effect of variation of C on oscillator frequency:

(a) Hartley (b) Colpitts.
8 Design Fabrication and Testing of k-derived filters (LP/HP).
9 Study of a Digital Storage CRO and store a transient on it.
10 To plot the characteristics of UJT and UJT as relaxation.
11 To plot the characteristics of MOSFET and CMOS.

04IEE204 INTEGRATED CIRCUITS LAB

1 Op-Amp characteristics and get data for input bias current measure the output-offset voltage and reduce it to zero and calculate slew rate.
2 Op-Amp in inverting and non-inverting modes.
3 Op-Amp as scalar, summer and voltage follower. 4
Op-Amp as differentiator and integrator.
5 Design LPF and HPF using Op-Amp 741
6 Design Band Pass and Band reject Active filters using Op-Amp 741.
7 Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts
8 Design (i) Astable (ii) Monostable multivibrators using IC-555 timer
9 Design Triangular & square wave generator using 555 timer.
10 Design Amplifier (for given gain) using Bipolar Junction Transistor.

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05IEE101 POWER ELECTRONICS

Unit-1 Power Semiconductor Devices: Characteristics of Power Transistor, Thyristor, GTO, Power MOSFET and IGBT. Two-Transistor Model of Thyristor.

Unit-2 SCR: Construction and characteristics, specification and ratings, pulse transformer, optical isolators, methods of turn on: R, RC, UJT relaxation oscillator, Rating extension by series and parallel connections, string efficiency. Protection of SCRProtection against over voltage, over current, dv/dt, di/dt, Gate protection.

Unit-3 Converters-I: Single Phase half & full wave converters with RL load, Single phase dual converters, Three phase half wave converters, Three phase full converters with RL load, Three phase dual converters.

Unit-4 Converters-II: Single and three-phase semi converters with RL load. Power Factor Improvement-Extinction angle control, symmetrical angle control, pulse width modulation control and sinusoidal pulse width modulation control. Inversion operation. Effect of load and source impedances.

Unit-5 DC-DC Converters: Choppers: Step Up/Down Copper, Chopper Configurations, analysis of type A Chopper Commutation of Choppers. Switched Mode Regulators-buck, boost, buckboost and cuk regulator.

05IEE102ELECTRICAL MACHINES-II

Unit-1 Introduction: General equation of inducted emf, AC armature windings: concentric and distributed winding, chording, skewing, effect on induced emf. Armature

and field mmf, effect of power factor and current on armature mmf, harmonics. Rotating fields.

Unit-2 Induction Motors: Construction of squirrel cage & slip ring induction motor, basic principles, flux and mmf waves, induction motor as a transformer. Equivalent circuits, torque equation, torque-slip curves, no load & block rotor tests, circle diagram, performance calculation. Effect of rotor resistance. Cogging, Crawling. Double cage squirrel cage induction motor, induction generator, induction regulator.

Unit-3 Starting & Speed Control of Induction Motors: Various methods of starting & speed control of squirrel cage & slip ring motor, cascade connection, braking.

Single-Phase Induction Motor: Revolving field theory, starting methods, equivalent circuits.

Unit-4 Synchronous Generator: Construction, types, excitation systems, principles. Equation of induced emf, flux and emf waves, theory of cylindrical rotor and salient pole machines, tworeactance theory, phasor diagrams, power developed, voltage regulation, OC & SC tests, zero power factor characteristics, potier triangle and ASA method of finding voltage regulation, synchronization, parallel operation, hunting and its prevention.

Unit-5 Synchronous Motors: types, construction, principle, phasor diagrams, speed torque characteristics, power factor control, V-curves, starting methods, performance calculations, applications, synchronous condenser, synchronous induction motor.

05IEE103 CONTROL SYSTEMS

Unit-1 Introduction: Elements of control systems, concept of open loop and closed loop systems., Examples and application of open loop and closed loop systems, brief idea of multivariable control systems.

Unit-2 Mathematical Modeling of Physical Systems: Representation of physical system (Electro Mechanical) by differential equations, Determination of transfer function by block diagram reduction techniques and signal flow method, Laplace transformation function, inverse Laplace transformation.

Unit-3 Time Response Analysis of First Order and Second Order System: Characteristic equations, response to step, ramp and parabolic inputs, transient response analysis, steady state errors and error constants, Transient & steady state analysis of LTI systems.

Unit-4 Stability of the System: Absolute stability and relative stability, Routh's stability criterion, root locus method of analysis, polar plots, Nyquist stability criterion. M and N Loci, Nichols chart.

Unit-5 Elementary Ideas of Compensation, Networks: Lag, lead and log lead networks, brief idea of proportional, derivative and integral controllers.

05IEE104 ANALOG COMMUNICATION

UNIT 1: **NOISE EFFECTS IN COMMUNICATION SYSTEMS:** Resistor noise, Networks with reactive elements, Noise temperature, Noise bandwidth, effective input noise temperature, Noise figure. Noise figure & equivalent noise temperature in cascaded circuits.

UNIT 2 : **AMPLITUDE MODULATION** : Frequency translation, Recovery of base band signal, Spectrum & power relations in AM systems. Methods of generation & demodulation of AM-DSB, AMDSB/ SC and AM-SSB signals. Modulation & detector circuits for AM systems. AM transmitters & receivers.

UNIT 3: **FREQUENCY MODULATION** : Phase & freq. modulation & their relationship, Spectrum &

band width of a sinusoidally modulated FM signal, phasor diagram, Narrow band & wide band FM. Generation & demodulation of FM signals. FM transmitters & receivers.. Comparison of AM, FM & PM. Pre emphasis & deemphasis. Threshold in FM, PLL demodulator.

UNIT 4: NOISE IN AM AND FM: Calculation of signal-to-noise ratio in SSB-SC, DSB-SC, DSB with carrier, Noise calculation of square law demodulator & envelope detector. Calculation of S/N ratio in FM demodulators, Super heterodyne receivers.

UNIT 5: **PULSE ANALOG MODULATION :** Practical aspects of sampling: Natural and flat top sampling. PAM, PWM, PPM modulation and demodulation methods, PAM-TDM.

05IEE105 TRANSMISSION & DISTRIBUTION OF ELECTRICAL POWER

Unit-1 **(i) Supply systems: -** Basic network of power system. Transmission and distribution voltage, effect of system voltage on size of conductor and losses. Comparison of DC 2- wire, DC 3- wire, 1- phase AC and 3- phase AC (3- wire and 4- wire) systems.
(ii) Distribution Systems: -
Primary and secondary distribution systems, feeder, distributor and service mains. Radial and ring- main distribution systems. Kelvin's law for conductor size.

Unit-2 **Mechanical features of overhead lines:-** Conductor material and types of conductor. Conductor arrangements and spacing. Calculation of sag and tension, supports at differentlevels, effect of wind and ice loading, stringing chart and sag template. Conductor vibrations and vibration dampers.

Unit-3 **Parameters of Transmission Lines:** Resistance inductance and capacitance of overhead lines, effect of earth, line transposition. Geometric mean radius and distance. Inductance and capacitance of line with symmetrical and unsymmetrical spacing Inductance and capacitance of double circuit lines. Skin and proximity effects. Equivalent circuits and performance of short and medium transmission lines**.**

Unit-4 **(i)**Generalized ABCD line constants, equivalent circuit and performance of long transmission line. Ferranti effect. Interference with communication circuits. Power flow through a transmission line **(ii) Corona:** Electric stress between parallel conductors. Disruptive critical voltage and visual critical voltage, Factors affecting corona. Corona power loss. Effects of corona.

Unit-5 **(i) Insulators:** Pin, shackle, suspension, post and strain insulators. Voltage distribution across an insulator string, grading and methods of improving string efficiency**. (ii) Underground**
Cables: Conductor, insulator, sheathing and armoring materials. Types of cables. Insulator resistance and capacitance calculation. Electrostatic stresses and reduction of maximum stresses. Causes of breakdown. Thermal rating of cable. Introduction to oil filled and gas filled cables.

05IEE106 OBJECT ORIENTED PROGRAMMING USING JAVA

Unit I JAVA: Variation from C++ to JAVA. Introduction to Java byte code, virtual machine, Program Elements : Primitive data types, variables, assignment, arithmetic, short circuit logical operators, Arithmetic operators, bit wise operators, relational operators, boolean logic operators, the assignment operators, operator precedence. Decision and control statements, arrays.

Unit II Objects and classes: Objects, constructors, returning and passing objects as

parameter. Nested and inner classes. Single and Multilevel Inheritance, Extended classes, Access Control, usage of super. Overloading and overriding methods. Abstract classes. Using final with inheritance.

Unit III Package and Interfaces: Defining package, concept of CLASSPATH, access protection, importing package. Defining and implementing interfaces.
String Handling: String constructors, special string operations, character extraction, searching and comparing strings, string Buffer class.

Unit IV Exception Handling: Exception handling fundamentals, Exception types, uncaught exceptions, try, catch and multiple catch statements. Usage of throw, throws and finally.

Unit V Applet: Applet Fundamentals, using paint method and drawing polygons, file management (Input/Output) in JAVA.

05IEE201 POWER ELECTRONICS LAB

1 Study the comparison of following power electronics devices regarding ratings, performance characteristics and applications: Power Diode, Power Transistor, Thyristor, Diac, Triac, GTO, MOSFET, MCT and SIT.
2 Determine V-I characteristics of SCR and measure forward breakdown voltage, latching and holding currents.
3 Find V-I characteristics of TRIAC and DIAC.
4 Find output characteristics of MOSFET and IGBT.
5 Find transfer characteristics of MOSFET and IGBT.
6 Find UJT static emitter characteristics and study the variation in peak point and valley point.
7 Study and test firing circuits for SCR-R, RC and UJT firing circuits.
8 Study and test 3-phase diode bridge rectifier with R and RL loads. Study the effect of filters.
9 Study and obtain waveforms of single-phase half wave controlled rectifier with and without filters. Study the variation of output voltage with respect to firing angle.
10 Study and obtain waveforms of single-phase half controlled bridge rectifier with R and RL loads. Study and show the effect of freewheeling diode.
11 Study and obtain waveforms of single-phase full controlled bridge converter with R and RL loads. Study and show rectification and inversion operations with and without freewheeling diode.
12 Control the speed of a dc motor using single-phase half controlled bridge rectifier and full controlled bridge rectifier. Plot armature voltage versus speed characteristics.

05IEE202 ELECTERICAL MACHINES LAB-II

1 Separation of transformer core losses and to determine the hystersis and eddy current losses at rated voltage and frequency.
2 To plot the O.C.C. & S.C.C. of an alternator and to determine its regulation by synchronous impedance method.
3 To synchronize an alternator across the infinite bus (RSEB) & summarize the effects of variation of excitation on load sharing.
4 To plot the V-curve for a synchronous motor for different values of loads.
5 To perform sumpner's back-to-back test on 3 phase transformers, find its efficiency &

parameters for its equivalent circuits.
6 To perform the heat run test on a delta/delta connected 3-phase transformer and determine the parameters for its equivalent circuit.
7 To perform no load and blocked rotor test on a 3 phase induction motor and to determine the parameters of its equivalent circuits. Draw the circle diagram and compute the following (i) Max. Torque (ii) Current (iii) slip (iv) p.f. (v) Efficiency.
8 To perform the load test on a 3-phase induction motor and determine its performance characteristics (a) Speed vs load curve (b) p.f. vs load curve (c) Efficiency vs load curve (d) Speed vs torque curve
9 Determination of losses and efficiency of an alternator.
10 To find Xd and Xq of a salient pole synchronous machine by slip test.

05IEE203 CONTROL SYSTEM LAB
1 Introduction to MATLAB Computing Control Software.
2 Defining Systems in TF, ZPK form.
3 (a) Plot step response of a given TF and system in state-space. Take different values of damping ratio and w_n natural undamped frequency. (b) Plot ramp response.
4 For a given 2_{nd} order system plot step response and obtain time response specification.
5 To design 1st order R-C circuits and observe its response with the following inputs and trace the curve. (a) Step (b) Ramp (c) Impulse
6 To design 2nd order electrical network and study its trarient response for step input and following cases. (a) Under damped system (b) Over damped System. (c) Critically damped system.
7 To Study the frequency response of following compensating Networks, plot the graph and final out corner frequencies. (a) Log Network (b) Lead Network (c) Log-lead Network.
8 To draw characteristics of a.c servomotor
9 To perform experiment on Potentiometer error detector.
10 Check for the stability of a given closed loop system.
11 Plot bode plot for a 2_{nd} order system and find GM and PM.

05IEE204 POWER SYSTEM DESIGN LAB
1 Generating station design**:** Design considerations and basic schemes of hydro, thermal, nuclear and gas power plants. Electrical equipment for power stations,
2 Auxiliary power supply scheme for thermal power plant.
3 Distribution system Design: Design of feeders & distributors. Calculation of voltage drops in distributors. Calculation of conductor size using Kelvin's law.
4 Methods of short term, medium term and long term load forecasting.
5 Sending end and receiving end power circle diagrams.
6 Instrument Transformers: Design considerations of CTs & PTs for measurement and protection.
7 Substations: Types of substations, various bus-bar arrangements**.** Electrical equipment for substations.

05IEE205 ENTREPRENEURSHIP DEVELOPMENT

1 Definition of entrepreneur, qualities of a successful entrepreneur, Charms of being an entrepreneur, achievement- motivation, leadership and entrepreneurial competencies.
2 Decision-making, procedures and formalities for starting own business, financial support
system.
3 Identification and selection of business opportunities and market survey, business plan. Implementation and customer satisfaction.
4 Business crises, problem-solving attitude, communication skill. Government policies for
entrepreneurs.
5 Knowledge based enterprises, Scope of entrepreneur in present context, area of future
entrepreneurship.
6 Marketing & Sales Promotion, Techno-Economic Feasibility Assessment by Preparation
of Preliminary & Detailed project report.

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06IEE101 MODERN CONTROL THEORY

Unit-1 **Introduction:** Concept of Linear vector space Linear Independence, Bases & Representation, domain and range. Concept of Linearity, relaxedness, time invariance, causality.

Unit-2 **State Space Approach of Control System Analysis:** Modern Vs conventional control theory, concept of state, state variable state vector, state space, state space equations, Writing statespace equations of mechanical, Electrical systems, Analogous systems.

Unit-3 State Space Representation using physical and phase variables, comparison form of system representation. Block diagram representation of state model. Signal flow graph representation. State space representation using canonical variables. Diagonal matrix. Jordan canonical form, Derivation of transfer function from state-model.

Unit-4 **Solution of State Equations:** Diagonalization, Eigenvalues and eigen vectors. Matrix exponential, State transition matrix, Properties of state transition matrix. Computation of State transition matrix concepts of controllability & observability. Pole placement by state feedback, Ackerman's formula

Unit-5 **Digital Control Systems:** Introduction, sampled data control systems, signal

reconstruction, difference equations. The z-transform, Z-Transfer Function. Block diagram analysis of sampled data systems, z and s domain relationship, digital PID controller

06IEE102 MICROPROCESSOR AND MICROCONTROLLER

UNIT 1 : INTRODUCTION: CPU, address bus, data bus and control bus. Input/ Output devices, buffers, encoders, latches and memories.

UNIT 2 : 8085 MICROPROCESSOR ARCHITECTURE: Internal data operations and registers, pins and signals, peripheral devices and memory organization, interrupts. CISC and RISC architecture overview.

UNIT 3 : 8085 MICROPROCESSOR INSTRUCTIONS: Classification, format and timing. Instruction set.

Programming and debugging, 8 bit and 16 bit instructions.

UNIT 4 : 8085 MICROPROCESSOR INTERFACING: 8259, 8257, 8255, 8253, 8155 chips and their applications. A/D conversion, memory, keyboard and display interface (8279).

UNIT 5: INTRODUCTION TO 8051 MICROCONTROLLER: General features & architecture of 8051. Memory, timers and interrupts. Pin details. Interfacing and applications.

06IEE103 PROTECTION OF POWER SYSTEM

Unit-1 **(i)** Causes and consequences of dangerous currents: Faults, overloads and switching over currents. Introduction to protection, trip circuit of a circuit breaker. Functional characteristics of a relay, zone of protection, primary and backup protection.

(ii) CTs & PTs: Current transformer construction, measurement and protective CTs. Type of potential transformers. Steady state ratio and phase angle errors in CTs and PTs. Transient errors in CT and CVT (Capacitive Voltage Transformer).

Unit-2 **Overcurrent Protection:** HRC fuse and thermal relay. Overcurrent (OC) relays - instantaneous, definite time, inverse time and inverse definite minimum time overcurrent relays, time and current gradings. Induction disc type relay. Directional overcurrent relay, 30°, 60° and 90° connections. Earth fault relay. Brief description of overcurrent protective schemes for a feeder, parallel feeders and ring mains.

Unit-3 **Generator Protection:** Stator protection - differential and percentage differential protection, protection against stator inter-turn faults, stator overheating protection. Rotor protectionprotection against excitation and prime mover failure, field earth fault and unbalanced stator currents (negative sequence current protection).

Unit-4 **(i) Transformer Protection:** Percentage differential protection, magnetizing inrush current, percentage differential relay with harmonic restraint. Buchholz relay. Differential protection of generator transfer unit.

(ii) Busbar Protection: Differential protection of busbars, high impedance relay scheme, frame leakage protection.

Unit-5 **(i) Transmission Line Protection:** Introduction to distance protection. Construction, operating principle and characteristics of an electromagnetic impedance relay. Effect of arc resistance. Induction cup type reactance and mho relays. Comparison between impedance, reactance and mho relays. Three stepped distance protection of transmission line.

(ii) Induction Motor Protection: Introduction to various faults and abnormal operating conditions, unbalance supply voltage and single phasing. Introduction to protection of induction motors- HRC fuse and overcurrent, percentage differential, earth fault and negative sequence voltage relays.

06IEE104 ADVANCED POWER ELECTRONICS

Unit-1 **AC Voltage Controllers:** Principle of On-Off Control, Principle of Phase control, Single Phase Bi-directional Controllers with Resistive Loads, Single Phase Controllers with Inductive Loads, Three Phase full wave AC controllers, AC Voltage Controller with PWM Control.

Unit-2 **Inverters:** Principle of Operation, Single-phase bridge inverters, Three phase bridge Inverters: 180 and 120 degree of conduction. Voltage control of Single Phase and Three Phase Inverters, Current Source Inverters, Harmonics and its reduction techniques.

Unit-3 **Cycloconverters:** Basic principle of operation, single phase to single phase, threephase to three-phase and three phase to single phase cycloconverters. Output equation, Control circuit.

Unit-4 **DC Power Supplies:** Switched Mode DC Power Supplies, flyback converter, forward converter, half and full bridge converter, resonant DC power supplies, bidirectional power supplies.

Unit-5 **AC Power Supplies:** Switched mode power supplies, Resonant AC power supplies, bidirectional AC power supplies. Multistage conversions, Control Circuits: Voltage Mode Control, Current Mode Control

06IEE105DATA STRUCTURES IN C

Unit-1 **Performance Measurement:** Space complexity and Time complexity, big oh, omega and theta notations and their significance. Linear Lists - **Array** and linked representation, singly & doubly linked lists. Concept of circular linked lists.

Unit-2 **Array & Matrices:** Row and Column Major mapping & representation, irregular 2D array, Matrix operations, Special matrices: diagonal, tri-diagonal, triangular and symmetric. Sparse matrices representation and its transpose.

Unit-3 **Stacks:** Representation in array & linked lists, basic operation, Applications of stacks in parenthesis matching, towers of Hanoi etc. Queues - Representation in array & linked lists, applications, circular queues.

Unit-4 **Trees:** Binary Tree, representation in array & linked lists, basic operation on binary trees, binary tree traversal (preorder, post order, in order). Search Trees - Binary search tree, indexed-binary search tree, basic operation, AVL tree, B-tree & Heap Tree.

Unit-5 **Graphs:** Representation of unweighted graphs, BFS, DFS, and Minimum cost spanning trees, Single source shortest path. Sorting - Bubble sort, insertion sort, merge sort, selection sort, quick sort, heap sort.

06IEE106 DIGITAL COMMUNICATION AND INFORMATION THEORY

Unit-1 **PCM & DELTA Modulation Systems:** PCM and delta modulation, quantization noise in PCM and delta modulation. Signal-to-noise ratio in PCM and delta modulation, T1 Carrier System, Comparison of PCM and DM. Adaptive delta Modulation. Bit, word and frame synchronization, Matched filter detection.

Unit-2 **Digital Modulation Techniques:** Various techniques of phase shift, amplitude shift and frequency shift keying. Minimum shift keying. Modulation & Demodulation.

Unit-3 **Error Probability in Digital Modulation:** Calculation of error probabilities for PSK, ASK, FSK & MSK techniques.

Unit-4 **Information Theory:** Amount of Information, Average Information, Entropy, Information rate, Increase in Average information per bit by coding, Shannon's Theorem

and Shannon's bound, Capacity of a Gaussian Channel, BW-S/N trade off, Orthogonal signal transmission.
Unit-5 **Coding:** Coding of Information, Hamming code, Single Parity-Bit Code, Linear Block code, cyclic code & convolutional code

06IEE201 MICROPROCESOR LAB

1. Study the hardware, functions, memory structure and operation of 8085 microprocessor kit.
2. Program to perform integer division: (i) 8-bit by 8-bit (ii) 16-bit by 8-bit.
3. Transfer of a block of data in memory to another place in memory in the direct and reverse order.
4. Searching a number in an array and finding its parity.
5. Sorting of array in: (i) Ascending (ii) Descending order
6. Programme to perform following conversion: (i) BCD to ASCII (ii) BCD to Hexadecimal
7. Programme to multiply two 8-bit numbers.
8. Programme to generate and sum 15 fibanocci numbers.
9. Programme for rolling display of message "INDIAN".
10. To insert a number at correct place in a sorted array.
11. Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light, and sequential lights on off by above hardware.
12. Generation of different waveform on 8253/ 8254 programmable timer.

06IEE202 POWER SYSTEM LAB

1 Study the burden effect on the performance of CT and measure ratio error.
2 Find out the sequence components of currents in three 1-Phase transformers and 3-Phase transformer and compare their results.
3 (i) Study over current relay.
(ii) Draw the current-time characteristic of an over current relay for TMS=1 & 0.5 and PSM=1.25 & 1.0.
4 (i) Study percentage bias differential relay.
(ii) Plot the characteristics of a percentage bias differential relay for 20%, 30% and 40% biasing.
5 Study gas actuated Buchholz relay.

06IEE203 MATLAB PROGRAMMING LAB

1 Basics of MATLAB matrices and vectors, matrix and array operations, Saving and loading data, plotting simple graphs, scripts and functions, Script files, Function files, Global Variables, Loops, Branches, Control flow, Advanced data objects, Multidimensional matrices, Structures, Applications in linear algebra curve fitting and interpolation. Numerical integration, Ordinary differential equation. (All contents is to be covered with tutorial
sheets)
2 **Simulink:** Idea about simulink, problems based on simulink. (All contents is to be covered with tutorial sheets)

06IEE204 ADVANCED POWER ELECTRONICS LAB

1 Study and test AC voltage regulators using triac, antiparallel thyristors and triac & diac.
2Study and test single phase PWM inverter.

3 Study and test buck, boost and buck- boost regulators. 4
Study and test MOSFET chopper.
5 Study and test Zero voltage switching.
6 Study and test SCR DC circuit breaker.
7 Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic.
8 Control speed of a single-phase induction motor using single phase AC voltage regulator.
9 (i) Study single-phase dual converter. (ii) Study speed control of dc motor using singlephase dual converter.
10 Study one, two and four quadrant choppers (DC-DC converters).
11 Study speed control of dc motor using one, two and four quadrant choppers. 12
Study single-phase cycloconverter.

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07IEE101 DATA BASE MANGEMENT SYSTEM

Unit-1 Introduction, need, purpose and goals of DBMS. DBMS Architecture, Concept of keys, Generalization and specialization, introduction to relational data model, ER modeling, concept of ER diagram.
Unit-2 **Database Design:** Conceptual Data Base design. Theory of normalization, Primitive and composite data types, concept of physical and logical databases, data abstraction and data independence, relational algebra and relational calculus.
Unit-3 SQL, DDL and DML. Constraints assertions, views database security. Application Development using SQL: Host Language interface, embedded SQL programming. GL's, Forms management and report writers. Stored procedures and triggers. Dynamic SQL, JDBC.
Unit-4 **Internal of RDBMS:** Physical data organization in sequential, indexed, random and hashed files. Inverted and multilist structures.
Unit-5 **(i) Transaction Management:** Transaction concept, transaction state, serializability, conflict erializabiltiy, view serializability. **(ii) Concurrency Control:** Lock based protocol. **(iii) Deadlock Handling:** Prevention detection, recovery. **(iv) Recovery System:** Log based recovery.

07IEE102 POWER SYSTEM ANALYSIS

Unit-1 (i) Percent and per unit quantities. Single line diagram for a balanced 3-phase system. **(ii) Admittance Model:** Branch and node admittances Equivalent admittance network and calculation of Y_{bus}. Modification of an existing Y_{bus}.
Unit-2 **(i) Impendence Model:** Bus admittance and impedance matrices. Thevenin's theorem and Z_b Direct determination of Z_{bus}. Modification of an existing bus. **(ii) Symmetrical fault Analysi** Transient on a Transmission line, short circuit of a synchronous machine on no load, short circu of a loaded synchronous machine. Equivalent circuits of synchronous machine under su transient, transient and steady state

conditions. Selection of circuit breakers, Algorithm for sho circuit studies. Analysis of 3 phase faults.
Unit-3 **(i) Symmetrical Components:** Fortescure theorem, symmetrical component transformation. Phase shift in star-delta transformers. Sequence Impedances of transmission lines, Synchronous Machine and Transformers, zero sequence network of transformers and transmission lines. Construction of sequence networks of power system.
(ii) Fault Analysis:
Analysis of single line to ground faults using symmetrical components, connection of sequence networks under the fault condition.
Unit-4 **Unsymmetrical Fault Analysis:** (i) Analysis of line-to-line and double line to ground faults using symmetrical components, connection of sequence networks under fault conditions. (ii) Analysis of unsymmetrical shunt faults using bus impedance matrix method.
Unit-5 **Load Flow Analysis:** Load flow problem, development of load flow equations, bus classification. Gauss Seidel, Newton Raphosn, decoupled and fast decoupled methods for load flow analysis. Comparison of load flow methods.

07IEE103ARTIFICIAL INTELLIGENCE TECHNIQUES
Unit-1 **Artificial Intelligence:** Introduction to AI and knowledge based Expert systems: Introduction,Importance and Definition of AI, ES, ES building tools and shells.
Unit-2 **Knowledge Representation:** Concept of knowledge, Representation of knowledge using logics rules, frames. Procedural versus. Declarative knowledge, forward versus backward chaining. Control Strategies: -Concept of heuristic search, search techniques depth first search, Breath first search, Generate & test hill climbing, best first search.
Unit-3 **Artificial Neural Network:** Biological Neurons and synapses, characteristics Artificial Neural Networks, types of activation functions. **Perceptions:** Perception representation, limitations of perceptrons. Single layer and multiplayer perceptrons. Perceptron learning algorithms.
Unit-4 **Basic Concepts in Learning ANN:** Supervised learning, Back propagation algorithm, unsupervised learning, Kohonen's top field network & Algorithm.
Unit-5 **Fuzzy Logic:** Fuzzy logic concepts, Fuzzy relation and membership functions, Defuzzufication, Fuzzy controllers Genetic algorithm: concepts, coding, reproduction, crossover, mutation, scaling and fitness.

07IEE104 UTILIZATION OF ELECTRICAL POWER
Unit-1 **(i)Electric Heating:** Different methods of electric heating. Principle of high frequency induction and di-electric heating. Construction, operation, performance and applicationsof arc furnace and induction furnace. **(ii) Electric Welding:** Welding process, welding transformer, Classification of Electric Welding: arc welding, resistance welding, welding of various metals.
Unit-2 **Illuminations:** Definitions, laws of illuminations, polar curves, luminous efficiency, photometer, incandescent lamps: filament materials, halogen lamp. electric discharge lamps: sodium vapour lamp mercury vapour lamp and fluorescent lamp. **Light Calculations:** commercial, industrial, street and flood lighting.

Unit-3 **Electrolytic Process:** Principles and applications of electrolysis, electrodeposition, manufactures of chemicals, anodizing, electro polishing electro-cleaning, electroextraction, electrorefinig, electro-stripping (parting) power supplies for electrolytic process.
Unit-4 **Electric Traction & Means of Supplying Power:** Systems of Electric Traction: DC & AC Systems, Power Supply for Electric Traction System: Comparison and application of different systems. Sub-station equipment and layout, conductor rail & pantograph.
Unit-5 **Traction Methods:** Types of services, speed time and speed distance curves, estimation of power and energy requirements, Mechanics of train movement. Co-efficient of adhesion, Adhesive weight, effective weight. **Traction Motor Controls:** DC and AC traction motors, Series parallel starting. Methods of electric braking of traction motors.

07IEE105 POWER SYSTEM ENGINEERING
Unit-1 **Economic Operation of Power Systems:** Introduction, system constraints, optimal operation of power systems. Input output, heat rate and incremental rate curves of thermal generating units. Economic distribution of load between generating units within a plant. Economic distribution of load between power stations, transmission loss equation. Introduction to unit commitment and dynamic programming.
Unit-2 **Power System Stability -I:** Power angle equations and power angle curves under steady state and transient conditions. Rotor dynamics and swing equation (solution of swing equation not included), synchronizing power coefficient. Introduction to steady state and dynamic stabilities, steady state stability limit.
Unit-3 **Power System Stability-II:** Introduction to transient stability. Equal area criterion and its application to transient stability studies under basic disturbances, critical clearing angle and critical clearing time. Factors affecting stability and methods to improve stability.
Unit-4 **(i) Excitation Systems:** Introduction of excitation systems of synchronous machines, types of excitation systems, Elements of various excitation systems and their control (functional block diagrams and their brief description)-DC excitation systems, AC excitation systems, brushless excitation system. **(ii) Interconnected Power Systems:** Introduction to isolated and interconnected powers systems. Reserve capacity of power stations, spinning and maintenance resaves. Advantages and problems of interconnected power systems. Power systems inter connection in India.
Unit-5 (i) Tap Changing transformer, phase angle control and phase shifting transformer. Series compensation of transmission lines, location and protection of series capacitors, advantages and problems. (ii) Introduction to power system security. (iii) Introduction to voltage stability.

07IEE106 DIGITAL SIGNAL PROCESSING
UNIT 1 : SAMPLING - Discrete time processing of Continuous-time signals, continuous-time processing of discrete-time signals, changing the sampling rate using discrete-time processing.
UNIT 2 : TRANSFORM ANALYSIS OF LTI SYSTEMS - Introduction, The frequency response of LTI systems, System functions for systems characterized by LCCD (Linear Constant Coefficient Difference) equations, All-pass system,

MinimumPhase systems, Linear systems with linear phase.
UNIT 3 : STRUCTURES FOR DISCRETE-TIME SYSTEMS- Block diagram and signal flow graph representation of LCCD (LCCD - Linear Constant Coefficient Difference) equations, Basic structures for IIR and FIR systems, Transposed forms.
UNIT 4 : FILTER DESIGN TECHNIQUES - Introduction, Analog filter Design: Butterworth & Chebyshev.IIR filter design by impulse invariance & Bilinear transformation. Design of FIR filters by Windowing: Rectangular, Hanning, Hamming & Kaiser.
UNIT 5 : The Discrete Fourier transform (DFT), Properties of the DFT, Linear Convolution using DFT. Efficient computation of the DFT: Decimation-in-Time and Decimation-in frequency FFT Algorithms. Processing of speech signals: Vocoders, linear predictive coders.

07IEE201 DBMS LAB

1 Designing database and constraints using DDL statements.
2 Experiments for practicing SQL query execution on designed database. 3 Database connectivity using JDBC/ODBC.
4 Features of embedded SQL.
5 Designing front end in HLL and accessing data from backend database. 6 Designing simple projects using front end-back end programming.
7 Project for generating Electricity Bills
8 Project for managing student's attendance/marks details.

07IEE202 POWER SYSTEM MODELLING AND SIMULATION LAB-I

1 Simulate Swing Equation in Simulink (MATLAB)
2 Modelling of Synchronous Machine.
3 Modelling of Induction Machine.
4 Simulate simple circuits using Circuit Maker.
5 Modelling of Synchronous Machine with PSS
6.Simulation of Synchronous Machine with FACTS device.
7. Modelling of Synchronous Machine with FACTS device
8. Simulation of Synchronous Machine with FACTS devices.

07IEE203 DIGITAL SIGNAL PROCESSING LAB-I

Simulation in MATLAB Environment:

1. Generation of continuous and discrete elementary signals (periodic and non-periodic) using mathematical expression.
2. Generation of Continuous and Discrete Unit Step Signal.
3. Generation of Exponential and Ramp signals in Continuous & Discrete domain.
4. Continuous and discrete time Convolution (using basic definition).
5. Adding and subtracting two given signals. (Continuous as well as Discrete signals)

6. To generate uniform random numbers between (0, 1).
7. To generate a random binary wave.
8. To generate random sequences with arbitrary distributions, means and variances for following :
(a) Rayleigh distribution
(b) Normal distributions: N(0,1).
(c) Gaussion distributions: N (mx, ó x2)
9. To plot the probability density functions. Find mean and variance for the above distributions

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VIII-SEMESTER

08IEE101 EHV AC/DC TRANSMISSION

Unit-1 **EHV AC Transmission:** Need of EHV transmission lines, power handling capacity and surge impedance loading. Problems of EHV transmission, bundled conductors: geometric mean radius of bundle, properties of bundle conductors. Electrostatic fields of EHV lines and their effects, corona effects: Corona loss, audio and radio noise.

Unit-2 **Load Frequency Control:** Introduction to control of active and reactive power flow, turbine speed governing system. Speed governing characteristic of generating unit and load sharing between parallel operating generators. **Method of Load Frequency Control:** Flat frequency, flat tie line and tie line load bias control. Automatic generation control (description of block diagram only).

Unit-3 **Voltage Control:** No load receiving end voltage and reactive power generation. Methods of voltage control. Synchronous phase modifier, shunt capacitors and reactors, saturable reactors, Thynstorised static VAR compensators- TCR, FC-TCR and TSCTCR.

Unit-4 **FACTS:** Introduction to FACTS controllers, types of FACTS controllers, Brief description of STATCOM, Thyristor controlled series capacitors and unified power flow controller.

Unit-5 **HVDC Transmission:** Types of D.C. links, advantages and disadvantages of HVDC transmission. Basic scheme and equipment of converter station. Ground return. Basic principles of DC link control and basic converter control characteristics. Application of HVDC transmission.

08IEE102 ELECTRIC DRIVES AND THEIR CONTROL

Unit-1 **Dynamics of Electric Drives:** Fundamental torque equations, speed-torque conventions and multiquardant operation, equivalent values of drive parameters, nature and classification of load torques, steady state stability, load equalization, close loop configurations of drives.

Unit-2 **DC Drives:** Speed torque curves, torque and power limitation in armature voltage and field control, Starting, **Braking-**Regenerative Braking, dynamic braking and plugging. **Speed Control-**Controlled Rectifier fed DC drives, Chopper Controlled DC drives.

Unit-3 **Induction Motor Drives-I:** Starting, **Braking**-Regenerative braking, plugging and dynamic braking. **Speed Control**-Stator voltage control, variable frequency control from voltage source, Voltage Source Inverter (VSI) Control.
Unit-4 **Induction Motor Drives-II:** Variable frequency control from current source, Current Source Inverter (CSI) Control, Cycloconverter Control, Static rotor resistance control, Slip Power Recovery- Stator Scherbius drive, Static Kramer drive.
Unit-5 **Synchronous Motor Drive**: Control of Synchronous Motor-Separately Controlled and VSI fed Self-Controlled Synchronous Motor Drives. Dynamic and Regenerative Braking of Synchronous Motor with VSI. Control of Synchronous Motor Using Current Source Inverter (CSI)

08IEE103 SWITCH GEAR & PROTECTION
Unit-1 **(i) Static Relays:** Introduction to static relays, merits and demerits.
Comparators: amplitude and phase comparators, duality between amplitude and phase comparators. Introduction to (a) amplitude comparators-circulating current type, phase splitting type and sampling type, (b) phase comparators-vector product type and coincidence type.
(ii) Static over Current Relays: Introduction to instantaneous, definite time, inverse time and directional overcurrent relays.
Unit-2 **(i) Static Differential Relays:** Brief description of static differential relay schemes-single phase and three phase schemes. Introduction to static differential protection of generator and transformer.
(ii) Static Distance Relays: Introduction to static impedance, reactance and mho relays.
Unit-3 **(i) Carrier Current Protection:** Basic apparatus and scheme of power line carrier system. Principle of operation of directional comparison and phase comparison carrier protection and,carrier assisted distance protection.
(ii) Distance Protection: Effect of power swings on the performance of distance protection. Out of step tripping and blocking relays, mho relay with blinders. Introduction ton quadrilateral and elliptical relays.
Unit-4 **Circuit Breakers I:** Electric arc and its characteristics, arc interruption-high resistance interruption and current zero interruption. Arc interruption theories-recovery rate theory and energy balance theory. Restriking voltage and recovery voltage, develop expressions for restriking voltage and RRRV. Resistance switching, current chopping and interruption of capacitive current. Oil circuit breakers-bulk oil and minimum oil circuit breakers. Air circuit breakers.
Unit-5 **(i) Circuit Breakers II:** Air blast, SF_6 and vacuum circuit breakers. Selection of circuit breakers, rating of circuit breakers.
(ii) Digital Protection: Introduction to digital protection. Brief description of block diagram of digital relay. Introduction to digital overcurrent, transformer differential and transmission line distance protection.

08IEE104 NON-CONVENTIONAL ENERGY SOURCES
Unit-1 (i) Introduction: World energy situation, conventional and non-conventional energy sources, Indian energy scene.
(ii) Tidal Energy: Introduction to tidal power. Components of tidal power plants, double basin arrangement. Power generation. Advantages and limitations of tidal power

generation. Prospects of tidal energy in India.
Unit-2 **Solar Energy:** Solar radiation, solar radiation geometry, solar radiation on tilted surface. Solar energy collector. Flat- plate collector, concentrating collector - parabolidal and heliostat. Solar pond. Basic solar power plant. Solar cell, solar cell array, basic photo-voltaic power generating system.
Unit-3 **(i) Wind Energy:** Basic principle of wind energy conversion, efficiency of conversion, site selection. Electric power generation-basic components, horizontal axis and vertical axis wind turbines, towers, generators, control and monitoring components. Basic electric generation schemes- constant speed constant frequency, variable speed constant frequency and variable speed variable frequency schemes. Applications of wind energy.
(ii) Geothermal Energy: Geothermal fields, estimates of geothermal power. Basic geothermal steam power plant, binary fluid geothermal power plant and geothermal preheat hybrid power plant. Advantages and disadvantages of geothermal energy. Applications of geothermal energy. Geothermal energy in India.
Unit-4 **Nuclear Fusion Energy:** Introduction, nuclear fission and nuclear fusion. Requirements for nuclear fusion. Plasma confinement - magnetic confinement and inertial confinement. Basic Tokamak reactor, laser fusion reactor. Advantages of nuclear fusion. Fusion hybrid and cold fusion.
Unit-5 **Biomass Energy:** Introduction, biomass categories, bio-fuels. Introduction to biomass conversion technologies. Biogas generation, basic biogas plants-fixed dome type, floating gasholder type, Deen Bandhu biogas plant, Pragati design biogas plant. Utilization of bio gas. Energy plantation. Pyrolysis scheme. Alternative liquid fuels - ethanol and methanol. Ethanol production.

08IEE105 POWER SYSTEM STABILITY

UNIT-1 POWER SYSTEM STABILITY CONSIDERATIONS
Power system stability considerations – definitions-classification of stability-rotor angle and voltage stability-synchronous machine representation –classical model-load modeling concepts-modeling of excitation systems-modeling of prime movers.

UNIT-2 TRANSIENT STABILITY
Transient stability-swing equation-equal area criterion-solution of swing equation-Numerical methods-Euler method-Runge-Kutte method-critical clearing time and angle-effect of excitation system and governors-Multimachine stability –extended equal area criteriontransient energy function approach.

UNIT-3 SMALL SIGNAL STABILITY
Small signal stability – state space representation – eigen values- modal matrices-small signal stability of single machine infinite bus system – synchronous machine classical model representation-effect of field circuit dynamics-effect of excitation system-small signal stability of multimachine system.

UNIT-4 VOLTAGE STABILITY

Voltage stability – generation aspects - transmission system aspects – load aspects – PV
curve – QV curve – PQ curve – analysis with static loads – loadability limit - sensitivity
analysis-continuation power flow analysis - instability mechanisms-examples.

UNIT-5 METHODS OF IMPROVING STABILITY

Methods of improving stability – transient stability enhancement – high speed fault clearing – steam turbine fast valving-high speed excitation systems- small signal stability enhancementpower system stabilizers – voltage stability enhancement – reactive power control.

BOOKS RECOMMENDED:

1. Kundur, P., 'Power System Stability and Control', McGraw-Hill International Editions,
1994.
2. Anderson, P.M. and Fouad, A.A., 'Power System Control and Stability', Galgotia Publications, New Delhi, 1994.
3. Van Cutsem, T. and Vournas, C., 'Voltage Stability of Electric Power Systems', Kluwer Academic Publishers, 1998.
4. Taylor C.W., Power System Voltage Stability, McGraw Hill.

5. Anderson P.M. and Foud A. A., Power System Control and Stability, IEEE Press.

6. Kimbark E., Power System Stability, Vol. I, II & III, IEEE Press.

08IEE106 OPERATION & CONTROL OF POWER SYSTEMS

INTRODUCTION: Characteristics of power generation units(thermal, nuclear, hydro, pumped hydro), variation in thermal unit characteristics with multiple valves, Economic dispatch with and without line losses, lambda iteration method, gradient method, Economic dispatch without line losses, economic dispatch with line losses, lambda iteration method, gradient method, Newton's method, base point and participation factors.
TRANSMISSION LOSSES: Coordination equations, incremental losses, penalty factors, B matrix loss formula (without derivation), methods of calculating penalty factors.
UNIT COMMITMENT: constraints in unit commitment, priority list method, Dynamic programming method and Lagrange relaxation methods.
HYDRO THERMAL CO-ORDINATION: Introduction to long range and short range hydro scheduling, Types of short range scheduling problem, Scheduling energy. The short term hydro-thermal scheduling problems and its solution by Lambda-Gamma iteration method and gradient method
GENERATION WITH LIMITED ENERGY SUPPLY: take or pay fuel supply contract, composite generation production cost function, gradient search techniques.

OPTIMAL POWER FLOW FORMULATION: gradient and Newton method, linear programming methods.
AUTOMATIC VOLTAGE REGULATOR: load frequency control, single area system, multi-area system, tie line control.

BOOKS RECOMMENDED:

1. Kothari D.P. and Dhillon J.S., *Power System Optimization*, Prentice-Hall of India Pvt. Ltd. New Delhi
2. G L.K .Kirchmayer, *Economic Operation of Power Systems*, John Willey & Sons,N.Y.
3. Wood A.J, Wollenberg B.F , *Power generation operation and control.*
4. Kothari D.P. and Nagrath I.J., *Modern Power System Analysis* ,Tata Mc Graw-Hill Publishing Company Ltd., New Delhi

08IEE201 INDUSTRIAL ECONOMICS & MANAGEMENT

1 **Money Banking and Trade:** Functions of money, supply & demand for money, money price level & inflation, black money, meaning, magnitude & consequences. Functions of Commercial banks, banking system in India, shortcomings and improvements.. Function of RBI, monetary policy-making, objectives and features. Sources of public revenue, principles of taxation, direct and indirect taxes, Theory of international trade, balance of trade and payment, Foreign exchange control, devaluation New economic policy: Liberalization, extending privatization, globalization.
2 **Management Principles:** Management functions, responsibilities of management to society, development of management thought. Nature of planning, decision making, management by objectives, Line and staff authority relationships, decentralization and delegation of authority, span of management,
3 **Production Management:** Production planning and control, inventory control, quality control and Total quality management. Tools of project management - CPM, PERT, project information systems. Marketing functions, management of sales and advertising marketing research.
4 **Human Resource Management:** Function, application of industrial psychology for selection,training and recruitment. Communication process, media channels and barriers to effective communication, theories of motivation, leadership.
5 **Finance and Account Management: Engineering Economics:** Investment decision, present worth, annual worth and rate of return methods. Payback time. Need for good cost accounting system, cost control techniques of financial control, financial statements, financial ratios, break-even analysis, budgeting and budgetary control.

08IEE202 ELECTRICAL DRIVES AND CONTROL LAB

1 Study and test the firing circuit of three phase half controlled bridge converter.
2 Study and obtain waveforms of 3 phase half controlled bridge converter with R and RL loads.
3 Study and test the firing circuit of 3-phase full controlled bridge converter.
4 Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL loads.
5 Study and test 3-phase AC voltage regulator.

6 Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature voltage versus speed characteristic.
7 Control speed of dc motor using 3-phase full controlled bridge converter. Plot armature voltage versus speed characteristic.
8 Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator.
9 Control speed of universal motor using AC voltage regulator. 10
Study 3-phase dual converter.
11 Study speed control of dc motor using 3-phase dual converter.
12 Study three-phase cycloconverter and speed control of synchronous motor using cycloconverter.
13 Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-phase inverter.

08IEE203 DIGITAL SIGNAL PROCESSING LAB-II

Modeling and simulation using MAT LAB

1. Realising a given block diagram having multiplier, adder/subtractor and system (Discrete/Continuous)
with given Impulse response. Calculating output for given input.
2. To simulate the transmitter and receiver for BPSK
3. To design and simulate FIR digital filter (LP/HP).
4. To design and simulate IIR digital filter (LP/HP).

DSP Lab using TMS320C6XXX DSP Kits

5. To study the architecture of TMS320C6XXX DSP kits using Bloom with DSP.
6. To generate wave form (SINE, COSINE, SQUARE & TRIANGULAR).
7. Verification of Sampling Theorem.
8. Verification of linear/circular convolution.
9. To design FIR and FIR digital filter (LP/HP).

08IEE204 PROJECT STAGE-I

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IX-SEMESTER

09IEE101 FLEXIBLE AC TRANSMISSION SYSTEM

UNIT-1 INTRODUCTION:

Fundamentals of ac power transmission, transmission problems and needs, emergence of
FACTS-FACTS control considerations, FACTS controllers. Advantages of FACTS technology

UNIT-2 SHUNT COMPENSATION

Principles of shunt compensation – Variable Impedance type & switching converter type-
Static Synchronous Compensator (STATCOM) configuration, characteristics and control.
Mid point and end point voltage regulation of transmission line, and stability improvement. Comparison between STATCOM and SVC.

UNIT-3 SERIES COMPENSATION

Principles of static series compensation using GCSC, TCSC and TSSC, applications, Static Synchronous Series Compensator (SSSC).

UNIT-4 STATIC VOLTAGE AND PHASE ANGLE REGULATORS

(i) Static Voltage and Phase Angle Regulators: Voltage and phase angle regulation. Power flow control and improvement of stability by phase angle regulator. Introduction to thyristor controlled voltage and phase angle regulators (TCVR and TCPAR)
(ii) Introduction to thyristor controlled braking resistor and thyristor controlled voltage limiter.

UNIT-5 UPFC & IPFC

(i) UPFC: Unified Power Flow Controller (UPFC), basic operating principles, conventional transmission control capabilities. Comparison of UPFC to series compensators and phase angle regulator. Applications of UPFC.
(ii) IPFC: Interline Power Flow Controller (IPFC), basic
operating principles and characteristics. Applications of IPFC.

BOOKS RECOMMENDED:

1. Song, Y.H. and Allan T. Johns, 'Flexible ac transmission systems (FACTS)', Institution of Electrical Engineers Press, London, 1999.
2. Hingorani ,L.Gyugyi, ' Concepts and Technology of flexible ac transmission system', IEEE Press New York, 2000 ISBN –078033 4588.
3. R .Mohan Mathur and Rajiv K.Varma , 'Thyristor - based FACTS controllers for Electrical transmission systems', IEEE press, Wiley Inter science , ISBN no . 0-471-20643-1,2002.

4. K.R.Padiyar, 'FACTS controllers for transmission and Distribution systems' New Age international Publishers 1st edition -2007.

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