SWAMI VIVEKANAND UNIVERSITY, SIRONJA, SAGAR (M.P.)

SYLLABUS

For

BACHELOR OF TECHNOLOGY (B.Tech.)

ELECTRICAL & ELECTRONICS ENGINEERING (EX)

Course Code : BTEX

Department of Electrical & Electronics Engineering
Faculty of Engineering

Duration of Course	:	4 Year
Examination Mode	:	Semester
Examination System	:	Grading

Swami Vivekanand University, Sironja Sagar (M.P.)
2016-2017

BTEX0301 - ENGINEERING MATHEMATICS II

Unit I

Fourier Series: Introduction of Fourier series , Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier transform, Sine and Cosine transform.

Unit II

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations

Unit III

Second Order linear differential equation with variable coefficients : Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series Method

Unit IV

Linear and Non Linear partial differential equation of first order: Formulation of partial differential equations, solution of equation by direct integration, Lagrange's Linear equation, charpit's method. Linear partial differential equation of second and higher order: Linear homogeneous and Non homogeneous partial diff. equation of nth order with constant coefficients. Separation of variable method for the solution of wave and heat equations

Unit V

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem

References

(i) Advanced Engineering Mathematics by Erwin Kreyszig, Wiley india
(ii) Higher Engineering Mathematics by BS Grewal, Khanna Publication
(iii) Advance Engineering Mathematics by D.G.Guffy
(iv) Mathematics for Engineers by S.Arumungam, SCITECH Publuication
(v) Engineering Mathematics by S S Sastri. P.H.I.

BTEX0302 ELECTROMAGNETIC THEORY

Unit I

Cartesian, cylindrical & spherical co-ordinate systems, scalar & vector fields, gradient, divergence & curl of a vector field, Divergence theorem & Stokes's theorem, concept of vectors. Electrostatic Fields – Coulomb's law, electric field intensity due to different charge distribution viz. line charge, sheet charge, Field due to continuous volume – electric potential, properties of potential function, potential gradient equipotential surfaces, line of force, Gauss law, applications of Gauss law, Gauss law in point form, method of images.

Unit II

Laplace's & Poisson's equations, solution of Laplace's equation, Electric dipole, dipole moment, potential & electric field intensity due to dipole, Behavior of conductors in an electric field. Conductor & insulator, electric field inside a dielectric, polarization, Boundar value conditions for electric Field, Capacitance & Capacitances of various types of capacitors, Energy stored and energy density in static electric field, Current density, conduction & convection current density ohms law in point form, equation of continuity.

Unit III

Static Magnetic Field, Biot-Savart's law, Magnetic Field intensity due to straight current carrying filament, circular, square and solenoidal current carrying wire, Relationship between magnetic flux, flux density & magnetic Field intensity; Ampere's circuital law and its applications, magnetic Field intensity due to infinite sheet and various other configurations, Ampere's circuital law in point form, Magnetic force, moving charge in a magnetic field, Lorentz Force on straight and long current carrying conductors in magnetic field, force between two long & parallel current carrying conductors. Magnetic dipole & dipole moment, a differential current loop as dipole, torque on a current carrying loop in magnetic field, Magnetic Boundary conditions.

Unit IV

Scalar magnetic potential and its limitations, Vector magnetic potential and its properties, vector magnetic potential due to different simple configurations; Self and Mutual inductances, determination of self & mutual inductances, self inductance of solenoid, toroid coils, mutual inductance between a straight long wire & a square loop. Energy stored in magnetic Field & energy density, Faraday's Law, transformer & motional EMFs, Displacement current, Maxwell's equations as Generalization of circuit equations, Maxwell's equation in free space, Maxwell's equation for harmonically varying Field, static and steady fields, Maxwell's equations in differential & integral form.

Unit V

Electro Magnetic Waves : Uniform plane wave in time domain in free space, Sinusoidally time varying uniform plane wave in free space, Wave equation and solution for material medium,

Uniform plane wave in dielectrics and conductors, Pointing Vector theorem, instantaneous, average and complex poynting vector, power loss in a plane conductor, energy storage, Polarization of waves, Reflection by conductors and dielectric – Normal & Oblique incidence, Reflection at surface of a conducting medium, surface impedance, transmission line analogy.

References:

1. Mathew N.O Sadiku; Elements of Electromagnetic; Oxford.
2. P.V. Gupta; Electromagnetic Fields; Dhanpat Rai.
3. N.N. Rao; Element of Engineering Electromagnetic; PHI.
4. William H. Hayt; Engineering Electromagnetic; TMH.
5. John D. Kraus; Electromagnetic; TMH.
6. Jordan Balmian; Electromagnetic wave & Radiating System; PHI.
7. David K. Cheng; Fields and Wave Electromagnetic; Addison Wesley.
8. S.P. Seth; Electromagnetic Field ;Dhanpat Rai & Sons

Note: Field plotting of electromagnetic systems on a PC using standard soflwares. Application for low and high frequency devices. Suggested soflwares, GEMINI(Infolytica), ANSYS, ANSOFT, NISA.

BTEX0303 ELECTRICAL INSTRUMENTATION

Unit I

Measurement and error, Accuracy and precision, sensitivity resolution, Error & Error analysis, Effect of temperature, Internal friction, Stray field, Hysterisis and Frequency variation & method of minimizing them, Loading effects, due to shunt connected and series connect ed instruments, calibration curve, Testing & calibration of instruments.

Galvanometers – Theory & operation of ballistic galvanometer, D'arsonal galvanometer, galvanometer motion & damping, Sensitivity, Flux meter, Vibration galvanometer, Spot deflection galvanometer. Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling.

Unit II

Different types of Ammeter & Voltmeter – PMMC, MI, Electrodynamometer, Hotwire, Electrostatic, Induction, Rectifier, Ferro dynamic & Electro-thermic, Expression for control & deflection torque, their advantages, disadvantages & error, Extension of range of instruments using shunt & multiplier.

Unit III

Instrument transformers: Potential and current transformers, ratio and phase angle errors, testing of instrument transformers, Difference between CT and PT, errors and reduction of errors. **Measurement of power:** Power in AC and DC Circuit, Electrodynamometer type of wattmeter, Construction, theory, operation & error, Low power factor & UPF wattmeter, Double element and three element dynamometer wattmeter, Measurement of power in three phase circuit, one, two & three wattmeter method, Measurement of reactive power by single wattmeter, Measurement of power using CTs & PTs.

Unit IV

Measurement of Energy: Single phase induction type energy meter – construction & operation – driving and braking torques –errors & compensations – Testing by phantom loading and using R.S.S. meter- Three phase energy meter – Tri-vector meter – Maximum demand meter, Ampere hour meter.

Potentiometer – DC potentiometer standardization – Lab type Crompton's potentiometer, application of DC potentiometer, AC polar type and coordinate type potentiometer, their construction and
applications.

Unit V

Miscellaneous Instruments & Measurements: Power factor meter, Single phase and three phase Electro-dynamometer type & moving iron type.

Frequency meter – Vibrating reed, Resonance type & Weston type, Synchronoscope, Ohmmeter – series & stunt type, Multi-meter, Megger & Ratio meter.

Resistance Measurement – Classification of low, medium & high resistance – Voltmeter,

Ammeter, Wheatstone Bridge, Kelvin's double bridge & loss of charge methods for resistance measurement,

Earth resistance measurement.

Magnetic Measurement – B-H Curve, Hysterisis Loop determination, Power loss in sheet metal – Lloyd Fischer square for measurement of power loss.

References:

1. E W Golding & F C Widdis; Electrical Measurement & Measuring Instruments; Wheeler Pub.
2. A.K. Sawhney; Electrical & Electronic Measurements & Instrument; Dhanpat Rai & Sons Pub.
3. Buckingham & Price; Electrical Measurements; Prentice Hall

List of experiments (Expandable):

1. Measurement of low resistance using Kelvin's Double bridge
2. Measurement of medium resistance using Wheatstone's bridge
3. Measurement of high resistance by loss of charge method
4. Measurement of Insulation resistance using Megger
5. Measurement of earth resistance by fall of potential method and verification by using earth tester
6. Measurement of power in a single phase ac circuit by 3 voltmeter/ 3 Ammeter method
7. Calibration of a dynamometer type of wattmeter with respect to a standard/Sub Standard wattmeter
8. Calibration of a induction type single phase energy meter
9. Calibration of a dynamometer type of wattmeter by Phantom Loading method
10. Measurements using Instrument Transformers
11. Study of various types of Indicating Instruments
12. Measurement of Power in three phase circuit by one, two & three wattmeters.

BTEX0304 ELECTRONICS DEVICES & CIRCUITS -I

Unit I

Semiconductor Diode & Rectifiers: Semiconductor diodes, ideal & practical diode equivalent circuit & frequency response, graphical analysis of diode circuits, diode applications, clipping and clamping circuits, half wave & full wave rectifier circuits with & without filters.Type of diodes and their applications, Signal diodes, Power Diode, Zener diode, Varactor diode, Schottky diode, PIN diode, Tunnel diode, Photo diode. Direct tunneling equivalent cirucuit, Tunnel diode oscillator; Solar Cell, LED, LEDs specification & geometry of LEDs, Colours of LEDs, LCD, Diffusion and Transition capacitance of P-N junction diode, Simple zener regulators.

Unit II

Transistor Characteristics: Construction, principle of operation, V-I characteristics, Symbols, equivalent circuit, parameter calculations, applications, limitations and specifications of BJT, FET, UJT and MOSFET'S (Different configurations of transistors are to be considered), Specifications of BJT, FET, UJT and MOSFET's.

Unit III

Amplifiers: Biasing, DC Equivalent Model, criteria for fixing operating point and methods of bias stabilizaion, thermal runaway and thermal stability, small signal low- frequency transistor amplifier – circuits; h-parameters, representation of transistor, analysis of single stage transistor amplifier using h-parameters, voltage gain current gain, input impedance output impedance, Comparison of BJT & FET. RC coupled amplifier – frequency response, cascaded amplifiers (all configurations of BJT and FET are to be considered). High frequency model of transistor r and r, cut-off frequencies of a transistor, single stage and multi stage amplifiers, Calculation of bandwidth of single and multistage amplifiers, concept of gain bandwidth product. Specifications of amplifiers, effect of cascading on bandwidth, Darlington amplifier, boot strapping, stability and thermal consideration, Noise in BJT.

Unit IV

Feedback Amplifiers and Oscillators: Concept of feedback, negative & positive feedback gain & sensitivity, Bandwidth, classification of feedback amplifiers, general characteristics of negative feedback amplifier, effect of feedback on amplifiers characteristics, condition for oscillation, RC and LC type of oscillators, Crystal oscillators, frequency and amplitude stability of oscillations, Generalized analysis of LC oscillators, quartz, Hartley Clopitts, R-C Phase shift and Wein Bridge oscillators, UJT oscillator.

Unit V

Power Amplifiers and Tuned Amplifiers & Regulator: Classification of power amplifiers, Class A,B,AB and C power amplifiers, Push pull & complementary push pull amplifiers. Design of heat sinks, Power output, efficiency, cross – over distortion and harmonic distortion, Derating curve. Specifications of power amplifiers, single tunned and double tunned voltage amplifiers. Interstage design, Staibility consideration, Class B and Class C tuned power amplifiers and specifications.

References:

1. Nashelsky & Boysted; Electronic Devices and Circuits; PHI
2. Millman Halkias; Electronic Devices and Circuits; McGraw- Hill
3. Millman & Grabel; Micro Electronics; McGraw-Hill
4. Salivahanan; Electronic Devices and Circuits; TMH
5. Cathey; Electronic devices and circuits (Shaum); TMH
6. Bogart; Electronic Devices and Circuits; Universal Book Stall, Delhi
7. Millman & Halkias; Integrated Electronics; McGraw- Hill.
8. Nagrath I.J.; Electronics; PHI

List of experiments (expandable):

1. V-I Characteristics of different types of Diodes.
2. Applications of diodes and Design of various clipping and clamping circuits.
3. Design half & full wave rectifier
4. Design & Analysis of transistor amplifier in CE, CB & CC configuration.
5. Use of UJT as relaxation Oscillator.
6. Design & Analysis of JFET Amplifier.
7. Design & Analysis of MOSFET Amplifier.
8. To study and construct power amplifiers of various classes.
9. Study of various oscillators.

NOTE- - All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/ drafted on paper.

Step 2: Where ever applicable the designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER etc.).

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: Where ever required the bread board circuit should be fabricated on PCB.

BTEX0305 NETWORK ANALYSIS

Unit I

Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :- Transients in RL, RC&RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance, Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks, Dot convention, coupling co- efficient, tuned circuits, Series & parallel resonance.

Unit II

Network Theorems for AC & DC circuits- Thevenins & Norton's, Superpositions, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.

Unit III

Frequency domain analysis – Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain

Unit IV

Concept of signal spectra, Fourier series co-efficient of a periodic waveform, symmetries as related to Fourier coefficients, Trigonometric & Exponential form of Fourier series.

Unit V

Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z,Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.

References:

1. M.E. Van Valkenburg, Network Analysis, (PHI)
2. F.F.Kuo, Network Analysis.
3. Mittal GK; Network Analysis; Khanna Publisher
4. Mesereau and Jackson; Circuit Analysis- A system Approach; Pearson.
5. Sudhakar & Pillai; Circuit & Networks- Analysis and Synthesis; TMH
6. Hayt W.H. & J.E. Kemmerly; Engineering Circuit Analysis; TMH
7. Decarlo lin; Linear circuit Analysis; Oxford
8. William D Stanley : Network Analysis with Applications, Pearson Education
9. Roy Choudhary D; Network and systems; New Age Pub
10. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits :TMH
11. Chakraborti :Circuit theory: Dhanpat Rai
12. B.Chattopadhyay & P.C.Rakshit; Fundamental of Electrical circuit theory; S Chand
13. Nilson & Riedel , Electric circuits ;Pearson

List of experiments (Expandable):

1. To Verify Thevenin Theorem.
2. To Verify Superposition Theorem.
3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman's Theorem.
6. To Determine Open Circuit parameters of a Two Port Network.
7. To Determine Short Circuit parameters of a Two Port Network.
8. To Determine A,B, C, D parameters of a Two Port Network
9. To Determine h parameters of a Two Port Network
10. To Find Frequency Response of RLC Series Circuit.
11. To Find Frequency Response of RLC parallel Circuit.

NOTE- - All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/ drafted on paper.

Step 2: Where ever applicable the designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER etc.).

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: Where ever required the bread board circuit should be fabricated on PCB.

BTEX0307 SELF STUDY (INTERNAL ASSESSMENT)

Objective of Self Study: is to induce the student to explore and read technical aspects of his area of interest *I* hobby or new topics suggested by faculty.

Evaluation will be done by assigned faculty based on report/seminar presentation and viva.

BTEX0308 SEMINAR / GROUP DISCUSSION(INTERNAL ASSESSMENT)

Objective of GD and seminar is to improve the MASS COMMUNICATION and CONVINCING/ understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.

BTEX0401 - ENGINEERING MATHEMATICS III

Unit I

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals

Unit II

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit IV

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis |:Students t-test, Fisher's z-test, Chi-Square Method

Reference:

(i) Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
(ii) Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
(iii) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication
(iv) Numerical Methods using Matlab by Yang,Wiley India
(v) Pobability and Statistics by Ravichandran ,Wiley India
(vi) Mathematical Statistics by George R., Springer

BTEX0402 – ELECTRICAL AND ELECTRONICS MATERIAL

Unit I

Classes of Engineering Materials – Metals & alloys, ceramics, organic polymers and composite material. Classification of solids from electrical Engineering point of view. Conducting material – properties of conductors, characteristics of good conductor material, commonly used conducting materials, conductor materials for overhead lines, types of conductors, conductor for underground cables, conductor materials used for electrical machines winding, resistor materials, types of resistors, materials for bus bar. Thermal conductivity of matter, super conductivity. Materials of MHD generator, Fuel cells, Thermoelectric generators, Thermonic conductors

Unit II

Dielectric Materials: Dielectric strength, factors affecting dielectric strength, dielectric loss, dissipation factor, factors affecting dielectric loss, permittivity & polarization, charging and discharging of dielectric, conduction through dielectric. Application of dielectric, different types of capacitors and materials used for them.Insulating materials, their properties – thermal, chemical, mechanical & electrical. Insulating materials like ceramic, mica, glass, rubber, resins, wax varnishes, Class of Insulation. Transformer oils & their testing. Piezoelectricity & Ferro electricity.

Unit III

Applications of semi conductor materials: type of semi conductors, working and applications of semiconductors, Temperature sensitive elements, photoconductive cells, photo voltaic cells; Varistor, Hall effect generator, LCD, Light dependent registors, LEDs, piezo – electric materials, semiconductor laser and its characteristics, photo conductors – photo diodes, avalanche photo diode, photo transistors.

Unit IV

Classification of magnetic materials: Dia-magnetism, Para magnetism, Ferro- magnetism, magnetisation curve, hysterisis loop, Magnetostriction, Factors affecting permeability and hysterisis, Anti – ferromagnetism, Ferrimagnetism, Magnetic resonance, B-H curve for different magnetic materials, loss of magnetism, impurities in ferromagnetic materials, soft and hard magnetic materials, ferrites. Fiber optic materials, lasers Special Purpose materials – Thermo couple, soldering, fuse, contact, refractory, fluorescent & phosphorescent, galvanizing and impregnation.

Unit V

IC Fabrication: planar process – Fabrication of BJT, FET, & CMOS devices, Monolithic diodes – Contacts – IC resistor & Capacitors - IC packaging – characteristic of IC components.

References:

1. TTTI Madras; Electrical Engineering Materials; TMH.
2. C. S. Indulkar and S. Thruvengadem; Electrical Engineering Materials; S. Chand.
3. A.J. Dekkor; Electrical Engineering Materials; PHI.

4. John Allison; Electrical Engineering Material s & Devices; TMH.
5. Kasap; Electronic Materials and devices; TMH
6. V. Raghvan; Material Science & Engineering; PHI.
7. Milman & Grabe; Micro Electronics; TMH
8. S.P. Seth & P.V. Gupta; Electrical Engineering Materials; Dhanpat Rai.

BTEX0403 – DIGITAL ELECTRONICS LOGIC DESIGN –I

Unit I

Number Systems and Codes : Digital number systems, base conversion, Binary, Decimal, octal, Hexadecimal, number system with radix r, Gray codes. Alphanumeric codes – ASCII code and EBCDIC codes, Hollerith code, concept of parity, complement r's & (r-1)'s, subtraction with complements, signed Binary numbers, Error Detecting & Correcting codes. Basic Theorems & Properties of Boolean Algebra: AND, OR, NOT operators, laws of Boolean Algebra, Demorgon's theorem, Boolean expression & logic diagram. Negative logic, Alternate logic gate representation (concept of bubbled gates) canonical and standard Forms (Minterms & Maxterms), sum of minterms & product of maxterms, conversion between canonical forms. Truth table & maps, 2,3,4,5 and 6 variable maps, Solving digital problems using Maps, Don't care conditions, Tabular minimization. Sum of product & product of sum reduction, Exclusive OR & Exclusive NOR circuits, Parity generator & checkers.

Unit II

Combinational Circuits : Design procedure, Adders (half and Full), subtractor (half and full) code convertors, Analysis of design, Universal building blocks, Implementation of any logic circuit with only NAND gates or with only NOR gates, Binary serial adder, parallel adder, serial/parallel adder, look ahead carry generator, BCD adder, Binary multiplier, Magnitude comparator, Decoder, Demultiplexer, Encoders, priority encoder, Multiplexers & implementation of combinational logic diagram, HDL for combinational circuit.

Unit III

Sequential Logic Circuit : Latches, SR latch with NAND & NOR gates, D latch, edge triggered flip flop, J-K flip flop, T flip flop, Master slave flip flop, Analysis of clocked sequential circuit, state table, state diagram, state reduction state equations, state assignments, flip flop excitation table & characteristic equations, Design procedure for sequential circuits, Design with state reduction, Applications of flip flop.

Unit IV

Registers and Counters : Asynchronous and Synchronous counter, counters with MOD numbers, Down counter, UP/DOWN counter, propagation delay in ripple counter, programmable counter, Pre-settable counter, BCD counter, cascading, counter applications, Decoding in counter, Decoding glitches, Ring Counter, Johnson counter, Rotate left & Rotate right counter,

Registers – Buffer, Shift left, shift right, shift left/Right registers, parallel in parallel out, serial in serial out, parallel in serial out, serial in parallel out registers.

Unit V

Random Access Memory, Timing waveform, Memory Decoding, Internal Construction, Coincident decoding, Address multiplexing, Read only memory – Combinational circuit implementation, Type of ROMs, combinational PLDs, Programmable Logic Array (PLA), Programmable Array Logic (PAL), sequential programmable device. Analog to digital conversion – Ramp type, dual slope, integration, successive approximation, parallel

conversion, parallel/ serial conversion, convertor specifications, Digital to Analog convertors – Binary weighted & R/2R D to A convertors.

References:

1. Mano; Digital design; Pearson Education Asia
2. Thomas Blakeslee; Digital Design with standard MSI and LSI; Wiley Interscience
3. Jain RP; Modern digital electronics; TMH
4. -M.Mano; Digital logic & Computer Design; PHI
5. Tocci ; Digital Systems Principle & applications; Pearson Education Asia
6. Gothmann; Digital Electronics; PHI
7. R.H.Gour; Digital Electronics and Micro Computer - (Dhanpat Rai)
8. –Malvino, Leech; Digital Principles and applications –(TMH)
9. Floyad; Digital Fundamentals (UBS)
10. Nripendra N. Biswas; Logic Design Theory (PHI)
11. D.C. Green; Digital Electronics (Pearson Education Asia)

List of Experiments (Expandable):

1. Verification of all the logic gates.
2. Design of BCD to Excess-3 code converter.
3. Implementation of NAND & NOR as Universal gate.
4. Design of RS, JK, T& D Flip flop.
5. Multiplexer /Demultipexer based boolean function
6. Design of combinational circuit for the
(i) Half adder
(ii) Full adder
(iii) Half subtractor
(iv) Full subtractor
7. Design various A-D & D-A convertors.

NOTE- - All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/ drafted on paper.

Step 2: Where ever applicable the designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER etc.).

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: Where ever required the bread board circuit should be fabricated on PCB.

BTEX0404 – ELECTRICAL MACHINE - I

Unit-I Transformer-I

Working principle, e.mf. equation, construction, phasor diagrams, equivalent circuit, voltage regulation, losses, separation of hysteresis and eddy current losses, efficiency, tests: open circuit and short circuit, load, Sumpner's test, Condition for maximum efficiency and regulation, Power and distribution transformer, allday efficiency, Excitation phenomenon, Autotransformer: working, advantages , its equivalent circuit and phasor diagram.

Unit II Transformer-II

Three phase transformer: its construction, groups and connections, their working and applications; Scottconnection; Parallel operation of Transformers: application, advantages, requirement and load sharing; Tap changers, cooling, conservator and breather. Pulse and high frequency transformers.

Unit III

Three phase Induction Motor- I

Working principle, construction, comparison of slip ring and squirrel cage motors, steady state analysis, phasor diagram and equivalent circuit, power flow diagram, torque-speed and power-speed characteristics, Losses and efficiency, No load and block rotor test, circle diagram

Unit IV

Three phase Induction Motor-II

Starting of squirrel cage and slip ring motors, power factor control, Cogging & Crawling, Double cage & Deep bar Indication Motor, impact of unbalanced supply and harmonics on performance, speed control, braking, Induction Generator. Applications

Unit V

Single Phase Motors:

Single Phase Induction motor; double revolving field theory, equivalent circuit and its determination, performance calculation, starting methods and types of single phase Induction motors: their working principle and applications, comparison with three phases Induction Motor. Single phase A.C. series motor, Servo motors, Linear Induction Motor

Reference Books:

1. M. G. Say, Alternating Current Machines', (5th Ed.) ELBS, 1986.
2. V.Del Toro, "Electrical Machines & Power Systems", 1985, Prentice-Hall, Inc., Englewood Cliffs.
3. V.Del Toro, "Electromechanical Devices for Energy Conversion & Control Systems", PHI Pvt. Ltd.,1975.

Text Books:

1. Electrical Machines by Nagrath and Kothari (TMH).
2. A.C. Machines by Langs dorf (McGraw-Hill)
3. Electrical Machines by Dr.P.S.Bimbhra (Khanna).
4. Electrical Machines by Ashfaq Hussain. (Dhanpat Rai).

List of Experiments (expandable)

Experiments can cover any of the above topics, following is a suggestive list:

1. Perform turn ratio and polarity test on 1-phase transformer
2. Perform load test on a 1-phase transformer and plot its load characteristic
3. Perform OC and SC tests on a 1-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.
4. Perform OC and SC tests on a 3-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.
5. Perform Sumpner's test on two 1-phase transformer and determine its efficiency at various load.
6. Perform No-load and block rotor test on a 3- phase IM and determine its equivalent circuit.
7. Perform load test on a 3- phase IM and plot its performance characteristics.
8. Study various types of starters used for 3- IMs.
9. Perform No-load and block rotor test on a 1- phase IM and determine its equivalent circuit.

BTEX0405 – ELECTRONIC DEVICES AND CIRCUITS-II

Unit I

Operational Amplifiers: Design aspects of Monolithic OpAmps, ideal characteristics, specifications, offset voltages and currents, frequency compensation techniques, measurement of opamp parameters, applications of op-amp inverting, non inverting amplifiers, integrators, function generator, logarithmic amplifier, instrumentation amplifiers, signal conditioning circuits, multi- vibrators, square wave generator, rectifiers, peak detectors & voltage regulator.

Unit II

Filters: Active filters, LPF, HPF, BPF, BEF, All pass filter, higher order filters & their design, switched capacitor filters, 555 timer and its applications, 556 function generator IC and its applications, phase locked ICs (PLL) 565 and their applications. IC 1496 (Balanced modulator applications).

Unit III

Acoustics: Microphones – Carbon, moving coil, ribbon, crystals condenser, their working principle and characteristic, Noise Figure and sensitivity and shielding. Loud Speakers – Moving Coil, electrodynamics horn type, multi-way speaker system, cross over network and their frequency characteristic. Various types of sound recording, magnetic recording, disk and crystal recording, Reverberations, building and studio acoustics, high fidelity.

Unit IV

Microwave: Generation of microwave by tubes, limitation of conventional tubes, Klystron amplifiers, reflex Klystron oscillator, magnetrons, traveling wave tube (TWT), backward wave oscillator (BWO), high frequency limitation of transistor, microwave transistor, Manley Rowe relations, parametric amplifiers and frequency multipliers, Gun effect, Gun diode oscillator, Avalanche effect, IMPATT & TRAPATT, BARRITT, TUNNETT, MITATT, microwave field effect transistors, MASER, LASER, Microwave Integrated Circuits (MICs) diode, Schottky barrier and backward diodes, PIN diode and their applications.

Unit V

Logic Families: DTL, ITL, ECL, TTL, MOS Logic Families, parameters and their comparison, transistor logic, interfacing of logic families, Integrated transistor, FET and MOS as switches, switching speed of integrated diode, transistor, FET devices, comparison between TTL and DTL, multi emitter transistor, Characteristics of TTL with Shottkey devices, transfer characteristics of ECL, Fan in and Fan out speed of operation, logic versatility of ECL gates, temperature compensated bias MOS, CMOS and their transfer characteristics, MOS invertors, CMOS inverter, rise and fall time in CMOS gates, interfacing BIT and CMOS gates.

References:

1. Tobbey; OP- Amps their design and Application
2. Gaikward RA; OP- Amp and linear Integreted circuits; PHI
3. Salivahanan; Linear Integrated Circuits; TMH

4. Kennedy J; Principles of communications; TMH
5. R.G.Gupta; Audio and Video System; TMH
6. Linear Integrated Circuits :D. Raychowdhary and Shail Jain
7. Introduction to System Design using Integrated ckt: B.S. Sonde (New Age Pub.).
8. Micro Electronics :Jacob Millman (ISE)
9. Integrated Circuits :Botkar (Khanna)
10. Applications of linear Integrated circuits :Clayton
11. Microwave Design and Circuits :S.L. Liao (PHI)
12. Microwaves and Radar :A.K. Maini (Khanna)

List of Experiments (Expandable):

1. Char. of Op-Amp (input offset voltage, slew rate CMRR, BW, Input bias current)
2. Linear application of OP-Amp (voltage follower, inviting and non-inverting amplifier and their frequency response adder subtractor differential amplifier, integrator and differential frequency response)
3. Study of Op-Amp as a comparator
4. Design of Schmitt trigger
5. Design of monoastable & astable multivibrator
6. To construct and plot frequency response of low & high pass filter.

NOTE- - All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/ drafted on paper.

Step 2: Where ever applicable the designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER etc.).

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: Where ever required the bread board circuit should be fabricated on PCB.

BTEX0406 – ELECTRICAL ENGINEERING SIMULATION LAB-I

Unit- I

MATLAB Basics

Simulation Mechanism and Simulation Tools, Starting and Ending MATLAB, MATLAB Desktop, Help
Browser, Types of Files, Command Input Assistance,

Operators and Special Characters, Variables and Arrays, Handling Arrays, Useful Built-in Functions, Control Structures, Input/Output Commands, File Handling

Unit- II

Introduction to Plotting

The plot command, Formatting and Labeling a Plot, Multiple Plots, Adding Legend, Sub Plots, Plotting Complex Data, 2-D and 3-D Plots, Plotting a Function, Plot Editor, Interactive Plotting using Plotting Tool

Unit- III

Programming in MATLAB

MATLAB Editor, MATLAB Programming, Debugging MATLAB Programs, MATLAB Debugger, Functions and Function Files, Differential Equation Solver, Symbolic Mathematics, Programming Examples

Unit- IV

Basic Electrical and Networks Applications

Analysis of Electrical Networks – Experiments based on Solution of Series-Parallel Circuits, Solution of system with linear equations - Experiments based on mesh and nodal analysis, Experiments for Validation of Network Theorems, Solution of Network Problems, Solution of First Order Differential Equation – Experiments for the study of Transients, Experiments for AC Signal Waveform Analysis, Study of Resonance in AC Circuit, Study of Frequency Response Waveform Analysis, Study of Resonance in AC Circuit, Study of Frequency Response

Unit- V

System Modeling using SIMULINK

Simulation Steps, Getting Simulink, Creating and Simulating a Simulink Model, Simulink Solution of Differential Equation, Assigning Variables, Observing Variables During Simulation, Storing/Saving Data, Linking M-file with Model file, Creating and Masking Sub-systems, Solution using Laplace Transform Approach, Solution using Laplace Transform Approach, Study of dynamic response, Simulation of Non-Linear System, Examples such as Simulink model to generate sine, cosine waveform and ramp signal

BOOKS

1. "MODELLING AND SIMULATION USING MATLAB-SIMULINK",2011
   DR SHAILENDRA JAIN, WILLEY INDIA.
2. "MATLAB PROGRAMMING", RUDRAPRASAD.

BTEX0501 - UTILISATION OF ELECTRICAL ENERGY

Unit-I

Illumination Engineering

Nature of light, units, sensitivity of the eye, luminous efficiency, glare. Production of Light; Incandescent lamps, arc lamps gas discharge lamps- fluorescent lampspolar curves, effect of voltage variation on efficiency and life of lamps, Distribution and control of light, lighting calculations, solid angle, inverse square and cosine laws, methods of calculations, factory lighting, flood lighting and street lighting, Direct diffused and mixed reflection & transmission factor, refractors, light fittings.

Unit-II

Heating, Welding And Electrolysis

Electrical heating-advantages, methods and applications, resistance heating, design of heating elements, efficiency and losses control. Induction heating: core type furnaces, core less furnaces and high frequency eddy current heating, dielectric heating: principle and special applications, arc furnaces: direct arc furnaces, Indirect arc furnaces, electrodes, design of heating elements, power supply and control. Different methods of electrical welding, resistance welding, arc welding, energy storage welding, laser welding, electro beam welding, and electrical equipment for them. Arc furnaces transformer and welding transformers. Review of electrolytic principles, laws of electrolysis, electroplating, anodizing-electro-cleaning, extraction of refinery metals, power supply for electrolytic process, current and energy efficiency.

Unit-III Traction

Special features of Traction motors, selection of Traction Motor, Different system of electric traction and their Advantages and disadvantages, Mechanics of train movement: simplified speed time curves for different services, average and schedule speed, tractive effort, specific energy consumption, factors affecting specific energy consumption, acceleration and braking retardation, adhesive weight and coefficient of adhesion,

Unit-IV Electric Drives

Individual and collective drives- electrical braking, plugging, rheostatic and regenerative braking load equalization use of fly wheel criteria for selection of motors for various industrial drives, calculation of electrical loads for refrigeration and air-conditioning, intermittent loading and temperature rise curve.

Unit-V

Introduction to Electric and Hybrid Vehicles

Configuration and performance of electrical vehicles, traction motor haracteristics, tractive effort, transmission requirement, vehicle performance and energy consumption.

References:

1 Open Shaw ,Taylor, .Utilization of electrical energy., Orient Longmans, 1962.
2 H. Pratap, Art and Science of Utilization of Electrical Energy.
3 Gupta, J.B., Utilization of Elect. Energy ,Katariya and sons, New Delhi.
4 Garg, G.C., Utilization of Elect. Power and Elect. Traction.
5 N V Suryanarayan, Utilization of Elect. Power including Electric Drives and Elect.

Traction, New Age International.
1 Hancok N N, Electric Power Utilisation, Wheeler Pub.
2 Mehrdad,Ehsani,Yirnin Gao,Sabastien.E. Gay,Ali Ernadi, "Modern electric, hybrid electric and fuel cell vehicles", CRC Press.

BTEX0502 – MICROPROCESSORS AND MICROCONTROLLERS

UNIT 1:

Microprocessor 8086

Introduction to 16-bit 8086 microprocessors, architecture of 8086, Pin Configuration, interrupts, minimum mode and maximum mode, timing diagram, Memory interfacing, Comparative study of Salient features of 8086, 80286 and 80386.

UNIT 2:

Microprocessor 8086 programming

Instruction set of 8086, Addressing mode, Assembler directives & operations, assembly and machine language programming, subroutine call and returns, Concept of stack, Stack structure of 8086, timings and delays,

UNIT 3:

Input-Output interfacing: Memory Mapped I/O and Peripherals I/O. PPI 8255 Architecture and modes of operation, Interfacing to 16-bit microprocessor and programming, DMA controller (8257) Architecture, Programmable interval timer 8254, USART 8251, 8 bit ADC/DAC interfacing and programming.

UNIT 4: Microcontroller 8051

Intel family of 8 bit microcontrollers, Architecture of 8051, Pin description, I/O configuration, interrupts; Interrupt structure and interrupt priorities, Port structure and operation, Accessing internal & external memories and different mode of operations, Memory organization, Addressing mode, instruction set of 8051 and programming.

UNIT 5:

8051 Interfacing, Applications and serial communication

8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/ counter functions, 8051 based thyristor firing circuit, 8051 connections to RS-232, 8051 Serial communication , Serial communication modes, Serial communication programming, Serial port programming in C.

List of Experiment

A. Introduction

1. Introduction to 8086 & 8051 kit, hardware features & modes of operation.
2. Technique of programming & basic commands of kit.
3. Instruction set of 8086 & 8051.

B. Assembly language programming of 8086 & 8051.

1. Write a program to add two 8-bit numbers.
2. Write a program to add two 16-bit numbers.
3. Write a program for 8-bit decimal subtraction.
4. Write a program to find 1's complement and then 2's complement of a 16-bit numbers.
5 .Write a program to find larger of two numbers.

6. Write a program to shift an 8-bit number left by 2-bits.
7. Write a program to multiply two 16-bit numbers .
8. Write a program for factorial of given number by recursion.
9. Write a program to square of an 8-bit number.
10. Write a program to generate a square wave of 2 KHz Frequency on input pin.

BOOKS:

1. Hall Douglas V.,Microprocessor and interfacing, Revised second edition 2006, Macmillan, McGraw Hill .
2. A.K. Ray & K.M.Bhurchandi, Advanced Microprocessors and peripherals- Architecture, Programming and Interfacing, Tata McGraw – Hill, 2009 TMH reprint..
3. Kenneth J. Ayala**,** The 8086 microprocessor: programming and interfacing the PC, Indian - edition , CENGAGE Learning.
4. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson education, 2005.
5. Kenneth J. Ayala**,** The 8051 Microcontroller Architecture, III edition, CENGAGE Learning.
6. V.Udayashankara and M.S.Mallikarjunaswamy, 8051 Microcontroller: Hardware, Software & Applications, Tata McGraw – Hill, 2009.
7. McKinlay, The 8051 Microcontroller and Embedded Systems – using assembly and C, PHI, 2006 / Pearson, 2006.

BTEX0503 – ELECTRICAL MACHINE – II

Unit-I

Synchronous generators, Construction features, Types of prime movers, Excitation system and brushes excitation, Polyphase distributive winding, Integral slot & Fractional slot winding, emf equation, Generation of harmonics and their elimination. Factor affecting size of synchronous generators, armature reaction, leakage reactive, synchronous reactance and impedance, Equivalent circuit of alternator, relation between generated voltage and terminal voltage, determination of equivalent circuit parameters, Short circuit ratio and its effect on performance, phasor diagram, Synchronous generator under load, Effect of excitation variation, Regulation curve, Regulation by synchronous impedance method, mmf method, Zpf and ASA method, Effect of AVR power and Torque relation.

Unit-II

Salient pole machine, Two reaction theory equivalent circuit model and phasor diagram, Determination of Xd and Xq by slip test, regulation of salient pole alternator, Power angle equation and characteristic Synchronizing of alternator with infinite busbar, Synchronizing power, Parallel operation and load sharing operation on infinite bus bar, Effect of varying excitation and mechanical torque, Effect of synchronizing current, Hunting of alternator, synchroncopes and phase sequence indicator.

Unit-III

Synchronous motors, Construction, Starting and Stopping of synchronous motor, Pull in torque, Motor under load power and torque, reluctance torque, Effect of excitation Effect of armature reaction, Power factor adjustment V curves, inverted V curves, synchronous motors as power factor correcting device, synchronous motors as frequency changer, Super synchronous motors, Hunting & damper winding efficiency and losses. Analysis under sudden short circuit, Transient parameters of synchronous machine, Various transient & sub transient reactances, Time constants, expression of transient and sub transient reactance in terms of self & mutual inductances of various winding, Analysis of three phase short circuit oscillograph and determination of transient parameters from oscillogram.

Unit-IV

Generalized theory of electrical Machines, Basic for development of generalized approach for analysis of electrical machines, Kron's Primitive machine, Concept of rotational & Transformer voltage, Pseudo stationery coil, Voltage and flux linkages, equation of electrical machines, based on coupled circuit approach. Expression for Self & Mutual inductance of various windings with respect to rotor position, Park's and Inverse park's transformation. Formulation of equations based on generalized approach for various machines,

Unit-V

Single phase and special motors.

Permanent magnet motors, P.M.synchronous motors Introduction to shaded pole motors, Repulsion motor, Universal motors, Hysteresis motor, Reluctance motor, Stepper motor, AC-series motor, Linear induction motors, DC & AC servo motors, Magnetic levitation vehicles, Brush less dc motors. List of Experiments:

1. No load and blocked rotor test on a single phase induction motor

2. To determine the regulation of a three – phase alternator by direct loading method
3. To determine the regulation of a three – phase alternator by Open Circuit and Short Circuit(OC & SC) Tests or synchronous impedance method
4. To determine regulation of a three – phase alternator by Zero Power Factor(ZPF) / Potier reactance method
5. To synchronize a 3 phase alternator with bus bar
6. To determine the direct axis reactance(Xd) and quadrature axis reactance(Xq) of a salient pole synchronous machine by slip test
7. To plot the short circuit oscillogram of armature current of a 3ph alternator under 3phase sudden short circuit to determine transient, sub transient and steady state component reactances and time constants.
8. To study the effect of variation of field current upon the stator current and power factor of a synchronous motor at various loads of a synchronous motor at various loads and plot "V" and inverted "V" curves of a synchronous motor

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References:

1. M.G. Say,Performance & design of AC machines, CBS publishers & distributors, Delhi, 3rd edition
2. A.E. Clayton & N.N. Nancock, The Performance & design of DC machines CBS publications & distributors,Delhi, 3rd edition
3. Nagrath I.J.& Kothari D. P., Electric Machines, Tata McGraw Hill , New Delhi, 2nd edition
4. Bharat Heavy Electricals Ltd, Transformers, Tata McGraw Hill
5. Syed A. Nasar,Electric Machines & Power Systems, Volume I , Tata McGraw Hill, New Delhi
6. A. E. Fitzerald & C. Kingsley & S.D. Umans , Electric Machinery Tata McGraw Hill ,New Delhi ,5th edition
7. P.S. Bhimbra, Generalized theory of Electrical Machines, Khanna publishers, Delhi, 5th edition.
8. Bhimbra. P.S., Electrical Machines, Khanna Pub.
9. Irving L. Kosow, Electric Machinery and Transformers, PHI.
10. Thedore Wildi, Electrical Machines Drives and Power Systems, Pearson Education, Asia.
11. Electrical Machines- Ashfaq Hussain. Dhanpat Rai Publication.
12. Langsdorf, Theory of Alternating Currents Machines, TMH.

BTEX0504 – POWER ELECTRONICS DEVICES & CIRCUITS

Unit-I

Advantages and application of power electronic devices characteristics, Symbol & application of power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottey diode MCTs. Principle of operation of SCR, Two transistor analogy, brief idea of construction of SCR, Static characteristics of SCR, Condition of turn on & off of SCR Gate characteristics, Method for turning on of SCR, Turnoff methods, different commutation echniques (Class A,B,C,D,E, & F Commutation) firing of SCR, Use of pubic transformer and opto isolator in firing, Resistance firing Ckt, Resistance capacitance firing circuit, UJT firing cut, and ramp triggering, firing for 3-Φ circuit. SCR rating & protection of SCR over voltage, Over current, Suprior firing, Design of snubber circuit and protection of gate of SCR, heating, cooling & mounting of SCR series and parallel operation of SCR, String efficiency & problem associated with series and parallel operation of SCR

Unit-II

Operation and analysis of single phase (Half wave & Full Wave) and multiphase (Three Phase) uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction, Fw small & very large inductive loads) and RLE loads. Estimation of average load voltage and load current for above rectifier cirucits active and reactive power input. Effect of free wheeling diode and source inductance on performance of these rectifier circuits . Comparison of mid point & Bridge rectifier circuits.

Unit-III

Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self cumulated inverters,, Mc- murray & MC murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction techniques.

Unit-IV

Principle of chopper operation, Various control strategies in chopper, Step up & step-up/step down choppers, chopper configuration (Type A,B, C,D, & E), Steady state analysis of chopper circuits, Current & voltage commutation of chopper circuits Jones & Morgens chopper

Unit-V

Single phase (mid point & bridge configuration) and three phase cyclo convertor configuration and operating principles. AC voltage controllers (using SCRs & Traics) single phase full wave controller with R and RL load, Estimation of RMS load voltage, RMS load current and input power factor, three phase AC voltage controller (Without analysis) Dual converter Switched mode voltage regulator buck, Boost, Buch & Boost, Ck regulators.

LIST OF EXPERIMENTS

1- VI CHARACTERISTICS OF SCR
2- VI CHARACTERISTICS OF DIAC
3- VI CHARACTERISTICS OF BJT

References:

1 M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson
2 Education, Singapore, 1993.
3 M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
4 P.C. Sen, Power Electonics, TMH.
5 M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
6 Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.,
7 Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub.
8 Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006.
9 Randall Shaffer, Fundaments of Power Electronics With MATLAB Cengage Leaening 2008.

BTEX0505 – POWER SYSTEM – I

Unit-I

An overview of Electrical Energy Generation General background, structure and components of power network. Power generation – Introduction to conventional, non-conventional & distributed generation, Effect of transmission voltage on power system economy. Selection of size of feeder. Comparison of isolated versus interconnected power system. Problems associated with modern large interconnected power system. Power Plant Economics - Load curves, base load, peak load, load factor, demand factor, diversity factor, capacity factor, utilization factor, cost of electricity, capital cost, fuel and operation cost.

UNIT-II

Transmission Line Components & Under Ground Cabling

Inductance resistance and capacitance of transmission line, Calculation of inductance for 1-Φ and 3-Φ, Single and double circuit line, Concept of GMR and GMD, Symmetrical & asymmetrical conduction configuration, Calculation of capacitance for 2 wire and 3 wire systems, Effect of ground or capacitance, Capacitance calculation for symmetrical and asymmetrical 1-phase and three phase, Single and double circuit line, Charging current, Transposition of line, Composite conductor, Skin and proximity effect, bundle conductor. Underground Cable Comparison of cables and overhead transmission lines, Classification of cables, requirement of cable construction, capacitance of single and multi-core cable, economic core diameter, dielectric stress in cable, Grading of cables, ionisation of Heating of cables, Phenomena of dielectric losses and sheath loss in cables, Thermal resistance of cables.

UNIT-III

Transmission systems & performance of transmission line

Various systems of transmission, effect of system voltage, comparison of conductor materials required for various overhead systems. Short, Medium & long transmission line and their representation, Nominal T, Nominal Л, Equivalent T and equivalent Л, network models, ABCD constants for symmetrical & asymmetrical network, Mathematical solution to estimate regulation & efficiency of all types of lines. Surge Impedance, loading, Interpretation of long line equation and its equivalent equation. Tuned power lines. Power flow through transmission line, Circle diagram, Method of voltage control, Static & rotating VAR generator, transformer control.

UNIT-IV

Insulator & Mechanical design Mechanical Design Types of conductors used in overhead transmission line, Types of line supports and towers, Distribution of conductors over transmission towers, Spacing between conductors, Length of span and sag- tension calculation for transmission line, Wind & ice loading, support of line at two different levels, string chart, Sag template, Stringing of conductor, Vibration and Vibration dampers. Insulator Materials used for transmission line insulations, Types of insulator for overhead transmission line failure of insulator, Voltage distribution of suspension insulator, String efficiency, Shielding and grading.

Unit-V

Voltage control & Distribution system

Ac single phase, 3 phase, 3wire & 4 wire distribution, Kelvin's law for most economical size of conductor Substation layout showing substation equipment, bus bar single bus bar and

sectionalized bus bar, main and transfer for bus bar system, sectionalized double bus bar system, ring mains.

References:

1. William Stevenson, Elements of Power System Analysis, McGraw Hill.
2. C.L. Wadhwa, Electrical Power System Analysis, New Age International.
3. D.P. Kothari, I.J. Nagrath, Modern Power System Analysis TMH, III Ed. Reprint 2008.
4. D.P. Kothari, I.J. Nagrath, Power System Engineering TMH II Ed. Reprint 2009.
5. John Grainger and William Stevenson, Power system Analysis, McGraw Hill.
6. Ashfaq Husain, Electrical Power Systems, Vikas Publishing House.
7. T. Wildi, Electrical Machines, Drives and Power Systems, Pearson Education.
8. C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy", New Age International.
9. Turar Goren, Electrical power Transmission system Engineering, John Wiley & Sons.
10. Power Systems Design- M.V. Deshpandey
11. J.B. Gupta ,Electrical Power Systems ,Katariya

List of Experiment

Subject- Power System I

1. To study the Thermal Power Station.
2. To study the Hydro Power Station.
3. To study the Nuclear Power Station.
4. To study & draw Towers used in Transmission lines.
5. To study & draw the different types of insulator.
6. To study & design Electrical Power Transmission line.
7. Determination of Transmission Parameters of a transmission line.

BTEX0506 – ELECTRICAL ENGG. SIMULATION LAB

LIST OF EXPERIMENT

1. To generate the pulse with the help of comparator.
2. To generate the pulse with the help of PWM techniques
3. To generate the pulse with the help of sine pulse width modulation
4. To find the time response for series RL, RC,RLC circuit.
5. Write a program to calculate the efficiency of the transformer at various laod conditions and plot the graph between efficiency and load for given data.
6. Write a program to determine the equivalent circuit parameter for given problem.
7. Determine the output waveform for the clipper and clamper circuit
8. To observe the output waveform for the MOSFET
9. To observe the waveform of single phase full wave rectifier circuit with R load
10. To observe the waveform of single phase half wave thyristor circuit with R load
11. To observe the waveform of single phase full wave thyristor circuit with RL & RLE load
12. To observe the waveform of single phase semi convertor circuit with RL & RLE load
13. To observe the waveform of single phase semi convertor circuit, when one of the thyristor is replaced by diode
14. To observe the waveform for class-B COMMUTATION
15. To observe the waveform of single phase half wave AC VOLTAGE CONTROLLER
16. To observe the load current ,voltage and speed waveform of Asynchronous Machine

REFERNCES :-

1.Shailandra Jain, Modeling and simulation using MATLAB/SIMULINK ,willey
2. I.J.Nagrath,D.P. Kothari, Electrical machine,TMH
3.P.C. Sen ,Power Electronics, TMH

BTEX0601 - COMMUNICATION ENGINEERING

Unit-I

Fourier series, Fourier Transform and its properties, Probability, random variables & their moments, their significance, convolution, auto correlation, cross Correlation & power spectral density, Gaussian & Rayleigh probability density Function, mean, variance & standard deviation, central limit theorem, voltage & Power decibel scales. Signal Processing : Types of signal, deterministic & random, periodic & non Periodic, analog & discrete, energy & power signals, Representation of sinusoid in different forms & their conversion.

Unit-II

Need of modulation in a communication system, block schematic of a typical Communication system. AM modulation system, modulation index, generation & detection of AM wave, side bands & power content in an AM wave, DSB-SC, SSB, their methods of generation & detection, vestigial side Band modulation, AM transmitter block diagram, comparison of various AM system, modulation & demodulation circuits. Relationship between phase & freq. modulation, FM wave & its spectrum, phasor diagram of a narrow band FM signal, wide band FM, methods of generation & detection of FM, discriminators, pre-emphasis & de-emphasis, Stereophonic FM broadcasting, FM transmitters.

Unit-III

TRF receiver & its limitations, necessity of heterodyning, super heterodyning Receivers, IF amplifiers, selection of intermediate frequency. RF amplifiers, detectors, AGC, AVC, FM receivers, AFC.

Unit-IV

Nyquist sampling theorem, TDM, pulse modulations & PCM, quantization error, necessity of non linear quantizer, A-law, μ-law, FSK & PSK, QPSK, QAM. Source of noise, noise figure, noise bandwidth, effective noise temperature, performance of AM, FM & digital system in presence of noise.

Unit-V

Satellite system block diagram, satellite freq. bands, satellite multiple access Format like TDMA, FDMA, transponders, earth station & satellite eclipses, Link calculation

References:

1. Taub & Shilling, Communication System, TMH
2. Singh & Sapre, Communication System, TMH
3. B.P. Lathi, Modern Digital and Analog Communication System
4. Simon Haykins,, Communication System
5. Wayne Tomasi, Advanced Electronic Communication System, PHI Learning
6. Schaum outline Series, Analog and Digital Communication
7. Martin S. Roden, Analog and Digital Communication

8. Frank R. Dungan, Electronic Communication System, Thomas/ Vikas
9. John G. Prokis, Masoud Salehi, Gerhand bBauch, Contemporary Communication Systems Using MATLAB, Cengage learning 2004.

BTEX0602 – CONTROL SYSTEMS

Unit-I

Modeling of dynamic systems: Electrical, Mechanical and hydraulic systems, Concept of transfer function, Simulation of differential equations in analog computer, State space description of dynamic systems: Open and closed loop systems, Signal flow graph, Mason's formula, Components of control systems: Error detectors (Synchros & Potentiometer), Servomotors (AC & DC), techo generators, power amplifier, steeper motors

Unit-II

Time – domain analysis of closed loop systems: Test signals, time response of first and second order systems, Time domain performance specifications, Steady state error & error constants Feedback control actions: Proportional, derivative and integral control.

Solution of state equation: Eigen values & eigenvectors digitalization state transitive matrix, stability Routh-Hurwit stability analysis.

Unit-III

Characteristics equation of closed loop system root loci, construction of loci, Effect of adding, poles and Zeros on the loci, Stability by root loci.

Unit-IV

Frequency, Domain analysis, Bode plots, Effect of adding, poles and Zeros, Polar plot, Nyquist stability analysis, Relative stability : Gain and phase margins.

Unit-V

Frequency- Domain compensation : lead lag, Lag-lead compensation, Design of compensating networks

References:

- I.J. Nagrath and M. Gopal, "Control system Engineering", New Age International.
- Modern Control Systems by Roy Chaudhary. PHI
- K. Ogata, Modern Control Engineering, PHI.
- B.C. Kuo, Automatic Control systems, PHI
- Gopal M., Control System : Principles & Design, TMH.
- Stefani, Shahian, Savant, Hostetter, "Design of feed back control System's", Oxford.
- Krishna. K. Singh & Gayatri Agnihotri, System Design through MATLAB control tool & Simulink, Stringer Verlag, U.K.
- Rudra Pratap, Getting Started with MATLAB, Oxford.
- Dhanesh N.Manik, Control Systems, CENGAGE Lea

List of Experiments:

- Time response of second order system.
- Characteristics of Synchros.
- Effect of feedback on servomotors.
- Determination of transfer function of A-C servomotor
- Determination of transfer function of D-C motor.
- Formulation of PI & PD controller and study of closed loop responses of 1^{st} and 2^{nd} order dynamic systems.
- State space model for classical transfer function using MATLAB.
- Simulation of transfer function using operational amplifier.
- Design problem: Compensating Networks of lead and lag.
- Temperature controller using PID.
- Transfer function of a DC generator.
- Characteristics of AC servomotor.
- Use of MATLAB for root loci and Bode plots of type-1, type-2 systems.
- Study of analog computer and simulation of 1^{st} order and 2^{nd} order dynamic equations.
- Formulation of proportional control on 1^{st} order and 2^{nd} order dynamic systems.
- Feed back control of 3^{rd} order dynamic Systems
- Study of lead and lag compensating networks.
- Effect of adding poles & zeros on root loci and bode plots of type-1, type-2 systems through MATLAB.

BTEX0603 – SWITCHGEAR & PROTECTION

UNIT-I

Fault Analysis

Fault Analysis per unit, representation and its advantages, faults in power systems (Symmetrical & Unsymmetrical), Single line and equivalent impendence diagram representation of power system components. Symmetrical components and its application to power systems, fault analysis, Sequence networks and their interconnection for different types of faults, Effect of fault impedance, Current limiting reactors, its location and application, Short circuit calculation.

Unit-II

Protective Relays

Requirement of relays, Primary & backup protection, Desirable qualities of relays, Concept of Pickup, reset & drop-off, Drop off/ Pickup ratio, inverse time & definite time charters tics, Attracted armature, Balanced Beam, Induction disc, Induction cup, Moving coil & moving Iron, Rectifier , Thermal, Bimetal directional relay, Frequency, DC, all or nothing relays. Pilot & negative sequence, Over current, Over Voltage, Directional, Differential and Distance relays, R-X diagram, Impedance mho & reactance relay.Introduction of static analog & digital relays, Classification of static relays.

Unit-III

Circuit Breakers

Elementary principle of arc quenching, recovery & re-striking voltage, arc quenching devices, description and operation of Bulk oil, Minimum oil, Air break, Air blast, SF6, Vacuum circuit breakers and DC circuit breakers, their comparative merits, LT Switch gear, HRC fuses, current limiting reactor.& their design features, influence of reactors in CB ratings Testing of circuit breaker, Description of a simple testing station, direct & indirect testing.

Unit-IV

System Protection

Protection of Generators - Earth Fault, percentage, differential, Loss of excitation, Prime mover failure, Over current, Turn to turn fault, Negative phase sequence, heating, Reverse power protection schemes

Protection of Transformers

Internal & external fault protection, Differential, Earth fault, Over Current, Over heating, Protection schemes, Protection of transmission lines, Over current, Distance and carrier current protection schemes.

Unit-V

Surge Protection & insulation co-ordination

Switching surges, Phenomena of Lightning, over voltage due to lightning, Protection against lightning, Lightning arrestors, selection of lightning arrestors, Surge absorbers and diverters, Rod gap, Horn gap expulsion type & valve type lightning arrestors, solid resistance and reactance earthing, Arc suppression coil, Earthing transformers, Earthwires, Earthing of appliances, insulation co-ordination, Definitions determination of line insulation, insulation level of substation equipment, co-ordination amongst items of substation equipment.

List of Experiments:

1. Determination of drop out factor of an instantaneous over current relay.
2. Determination of operating characteristic of IDMT relay.
3. Determination of operating characteristic of differential relay.
4. Study and operation of gas actuated protective relay.
5. Study and operation of static over current relay.
6. Determination of transmission line parameters using MATLAB.
7. Analysis of power system faults (Symmetrical & Asymmetrical) using MATLAB.
8. Study of SF6 circuit breaker
9. Protectional simulation study of generator, Transformer, Feeder & Motor protection.

References:

- B. Ravindran and M Chander, "Power System protection and Switchgear", New Age International.
- Badrirka, Power System protection and switchgear, TMH.
- CL Wadhwa, Electrical Power systems, New age International.
- Haddi Saadet, "Power System Analysis, TMH
- A.R. Bergen, Vijay Vittal, "Power System Analysis, Pearson Education, Asia.
- Switchgear & protection Sunil S. Rao. Khanna Publication.
- Ravindra P. Singh, Switchgear & Power System Protection, PHI Learning.

BTEX0604 – ELECTRONIC INSTRUMENTATION

Unit-I

Electronic Voltmeter: Electronic voltmeter and their advantages, VTVMs Differential amplifier type electronic voltmeter, D.C. voltmeter using direct coupled amplifier, chopper amplifier type of voltmeter, Electronic voltmeters using rectifiers, True RMS responding voltmeter, Electronic multimeters, Differential voltmeter, Vector voltmeter, Vector impedance meter, measurement of power at radio frequency, calorimeter, Bolometer

CRO: *Different parts of CRO, Its Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Screen for CRTs, Graticule, Vertical & Horizontal deflection system, Time base circuit, Oscilloscope probes and transducers, Attenuators, Application of CROs, Lissajous patterns, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog & Digital) Oscilloscopes.*

Unit-II

A.C. Bridge Measurement*: Sources and detectors, Use of Bridges for measurement of inductance, Capacitance & Q factor Maxwells bridge, Maxwells inductance capacitance bridge, Hays bridge, Andersons bridge, Owen's Bridge, De-sauty's Bridge, Schering Bridge, High Voltage Schering bridge, Measurement of relative permittivity, Heaviside cambell's bridge, Weins bridge, Universal bridge, Sources of errors in Bridge circuit, Wagner's Earthing device, Q meter and its applications and measurement methods.*

Transducers:*Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Resistive inductive and capacitive transducers, strain gauge and gauge factor, Thermistor, Thermo couples, LVDT, RVDT, Synchros, Piezo-Electric transducers, Magnet elastic and magnetostrictive Hall effect transducers, Opto-electronic transducers such as photo voltaic, Photo conductive, photo diode and photo conductive cells, Photo transistors, Photo optic transducers.*

Unit-III

Signal Generators:Fixed & variable frequency AF oscillators, Sine wave generators, Standard signal generator, AF Sine and Square wave generator Function generator, Square and pulse generator, Random noise generator, Sweep generator, TV Sweep generator, Marker generator, Sweep- Marker generator, Wobblyscope, Video pattern generator Vectroscope, Beat frequency oscillator

Wave analyser*:Basic wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion, analyzer, spectrum analyzer digital Fourier analyzer.*

Unit-IV

Digital Instruments Advantages of Digital instruments over analog instruments, resolution and sensitivity of Digital meters. Digital Voltmeter - Ramp type, Dual slope integration type, Integrating type, Successive approximation type, Continuous balance DVM or Servo balancing potentiometer type **J**VM. Digital Multimeter, Digital frequency meter, Time period measurement, High frequency measurement, Electronic counter, Digital tachometer, Digital PH

meter, Digital phase meter, Digital capacitance meter. Digital display system and indicators like CRT, LED, LCD, Nixies, Electro luminescent, Incandescent, Electrophoretic image display, Liquid vapour display dot-matrix display Analog recorders, Graphic recorders, Strip chart recorders, Galvanometer type recorders, Null recorders, single point & multipoint recorders, X-Y records, Ultraviolet recorders, Magnetic tape recorders, Basic components of tape recorders, Methods of recording, Direct recording, Frequency modulated recording, Pulse duration modulation recording, Digital tape recorders.

Unit-V

Instruments used in computer-controlled instrumentation RS 232C and IEEE 488, GPIB electric interface. Introduction to analog & Digital data acquisition systems-Instrumentation systems used, Interfacing transducers to electronic control & measuring systems Multiplexing - D/A multiplexing A-D Multiplexing, Special encoders. Digital control description Microwave instruments, Scattering parameters, Transmission and reflection parameters, Network analyzer, Measurement uncertainty measurement with scalar & vector network, Network analyzers, Microwave power measurement- Sources & detectors, Fiber optic power measurement, Stabilized calibrated light sources end to end measurement of fiber losses, Optical time domain reflectometry.

References:

- Albert. D. Helfrick, W.D. Cooper, "Modern Electronic Instrumentation and measurement techniques", PHI.
- Kalsi H.S., "Electronic Instrumentation", TMH.
- Ghosh, Introduction to Measurement & Instrumentation, forth Edition. PHI.
- Morris A.S., "Principles of Measurement & Instrumentation".
- Rangan C.S., G.R. Sarma, Mani, "Instrumentation : Devices & systems", TMH
- Murthy BVS, "Transducers and Instrumentation", PHI.
- Doeblin D.O., "Measurement Systems- Applications and Design".

List of Experiments:

1. Measurement of inductance of a coil using Anderson Bridge.
2. Measurement of capacitance of a capacitor using schering bridge.
3. LVDT and capacitance transducers characteristics and calibration.
4. Resistance strain gauge- Strain Measurement and calibration.
5. Measurement of R,L,C & Q using LCR-Q meter.
6. Study & measurement of frequency using Lissajous patterns.
7. Measurement of pressure using pressure sensor.
8. Study of Piezo-electric Transducer and Measurement of impact using Piezo-electric Transducer
9. Measurement of Displacement using LVDT.
10. Measurement of speed of a Motor using photoelectric transducer.
11. Study & Measurement using ph meter.
12. Temperature measurement & Control using thermo couple & using thermistor.

BTEX0605 – ENERGY CONSERVATION & MANAGEMENT

UNIT-I

General energy problem: Energy use patterns and scope for conservation.

Energy audit: Energy monitoring, Energy accounting and analysis, Auditing and targeting. Energy conservation policy, Energy management & audit, Energy audit, Types of energy audit, energy management (audit), qualities and function of energy managers, language of an energy manager, Questionnaire, Check list for top management, Loss of energy in material flow, energy performance, Maximizing system efficiency, Optimizing, input energy requirements, Energy auditing instruments, Material load energy balance diagram.

Unit-II

Thermodynamics of Energy Conservation. Basic principle. Irreversibility and second law efficiency analysis of systems. Primary energy sources, optimum use of prime-movers, energy efficient house keeping, energy recovery in thermal systems, waste heat recovery techniques, thermal insulation. Thermal energy audit in heating, ventilation and air conditioning. Maintenance and Energy audit – friction, lubrication and tribo-logical innovations. Predictive and preventive maintenance.

Unit-III

Load curve analysis & load management DSM, Energy storage for power systems (Mechanical, Thermal, Electrical & Magnetic) Restructuring of electric tariff from energy conservation consideration, Economic analysis depreciation method, time value of money, Evaluation method of projects, replacement analysis, special problems inflation risk analysis. Pay back period, Energy economics, Cost Benefit Risk analysis, Pay back period.

UNIT-IV

Energy efficient electric drives, Energy efficient motors V.S.D. power factor improvement in power system. Energy Conservation in transportation system especially in electric vehicle. Energy flow networks, Simulation & modeling, formulation & Objective & constraints, alternative option, Matrix chart.

Unit-V

Energy conservation task before industry, Energy conservation equipments, Co-Generation, Energy conservation process, Industry Sugar, Textiles, Cement Industry etc Electrical Energy Conservation in building, heating and lighting. domestic gadgets

References:

- Energy Management – W.R. Murphy & G. Mckey Butler worths.
- Energy Management Head Book- W.C. Turner, John Wiley
- Energy Management Principles- Craig B. Smith, Pergamon Press
- Energy Conservation- Paul O Callagan- Pergamon Press
- Design & Management of energy conservation. Callaghan,
- Elect, Energy Utilization & Conservation. Dr. Tripathi S.C.,

BTEX0701 POWER SYSTEM II

Unit -I

General - Problems associated with modern interconnected power Systems, deregulation, power systems restructuring, distributed generation, congestion, available transfer capacities, pricing of energy and transmission services.

Unit -II

Power flow studies - Formulation of static power flow equations and solutions using Gauss-Seidel, Newton Raphson and FDLF methods, comparison of these methods, Economic operation of power system - Economic dispatch, Emission dispatch, line loss, ITL, economic dispatch using lagrangian multiplier method.

Unit-III

MW Frequency control- Coherency, control area, modeling of speed control mechanism, load damping, block diagrammatic representation of single and two area interconnected system, static and dynamic response, .optimum parameter adjustment.

Unit-IV

MVAR Voltage control Problem- Difference in control strategy over MW - f control, characteristics of an excitation system, DC AC and static excitation system, General block diagram representation of voltage regulators.

Unit-V

Power System Stability - Steady state, dynamic and transients stability, Swing equation , equal area criterion, solution of swing equation using step by step method modified Eulers method and Rnge-Kutta method,methods of improving transient stability.

Reference Books :

1 Modern Power System Analysis-by I.J. Nagrath & D.P. Kothari Tata Mc Graw – Hill Publication Company Ltd 2nd edition.

2. A Chakrawarti Power System Analysis:Operation and Control PHI Learning 3rd edition

3. Reactive power Control in Electric Systems-by T.J.E. Miller, John Wiley & Sons.

4. Electrical Power Systems-by C.L. Wadhwa New Age International (P) Limited Publishers, 2nd edition 1998.

5. Elgerd O.I., "Electric Energy Systems Theory", TMH, New Delhi, Second Edition 1983.

6. Prabha Kundur, "Power system stability and control", Mc-Graw Hill Inc, New York, 1993.

7. Taylor C.W., "Power System Voltage Stability", Mc-Graw Hill Inc, New York, 1993.

8. Nagrath IJ, Kothari D.P., "Power System Engineering", Tata Mc-Graw Hills, New Delhi 1994.

9. Weedy B.M. "Electric Power System" John Wiley and Sons, 3rd edition.

10. P.S.R. Murthy, "Power System Operation and Control", B S Publ-ication
11. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
12. T.K. Nagsarkar, M.S. Sukhiza, -"Power System Analysis", Oxford University Press.
13. Economic Operation of Power Systems- by L.K. Kirchmayer Wiley Eastern Ltd.

List Of Experiments:

1. To develop a program in Matlab for information of Y-bus matrix for N bus system.
2. Load flow solution for 3-bus system using Gauss- Seidel, Newton Raphson and FDLF methods up to 3 iteration.
3. Load flow solution for IEEE 6-bus and 30-bus system in Matlab using Newton Raphson method.
4. Assessment of transient stability of a single machine system.
5. Effect of compensation on voltage profile of IEEE 6-bus system.
6. Study of any software tools (PSCAD,EDSA, Mi POWER, ETAP etc)

BTEX0702 ELECTRICAL DRIVES

Unit - I

Control of D.C. motors by converters:- Introduction to Thyristor Controlled Drives, single phase semi and fully controlled converters and three semi and fully controlled converters connected to d.c. separately excited and d.c. series motors-continuous current operation, Output voltage and current waveforms, Speed and Torque expression, Speed-Torque Characteristics, Problems on converter fed d.c. motors.

Unit - II

Four quadrant operation of D.C. Drives.: Introduction to Four quadrant operation, Motoring operations, Electric braking, Plugging, dynamic and regenerative braking operations. Four quadrant operation of D.C. motor by Dual converters-Closed loop operation of DC motor (Block diagram only)Control of D.C. Motors by Choppers:-Single quadrant, Two-quadrant and four quadrant chopper fed d.c. separately excited and series excited motors, Continuous current operation, Output voltage and current waveforms-Speed torques expressions-Speed torque characteristics, Problems on Chopper fed d.c. motors, Closed loop operation (Block diagram only)

Unit-III

Control of Induction Motors on stator side:-Control of Induction Motor by AC Voltage controllers- Waveforms, Speed torque characteristics, Variable frequency control of induction motor by Voltage Source,Current Source inverters and cycloconverters, PWM control Comparison of VSI & CSI operations, Speed- torque Characteristics, Numerical problems on induction motor drives, Closed loop operation of induction motor drives. (Block diagram only)

Unit-IV

Control of Induction Motors from rotor side:-Static rotor resistance control, Slip power recovery static Scherbius Drive, Static Kramer Drive, Their performance and speed torque characteristics advantages- application-problems.

Unit-V

Control of Synchronous Motors:- Separate control & Self control of synchronous motors, Operation of self controlled synchronous motors by VSI, CSI and Cycloconverters. Load commutated CSI fed Synchronous motor, Operation, Waveform, Speed torque Characteristics, Application, Advantage, Numerical problems, Closed loop operation os synchronous motors drives. (Block diagram only)

References:

1. G.K. Dubey "Fundamentals of Electrical Drives"-. Narosa Publications
2. Gopal K. Dubey "Power semiconductor Controlled Drives"- PHI
3. S.B. Dewan, G.R. Slemon, A. Straughen "Power semiconductor Controlled Drives

4. B.K. Bose "Power Electronic control of AC Drives". PHI Learning.
5. Ned Mohan Electrical Drive Wiley India
6. V. Subramanyam "Thyristor control of Electric Drive" Tata Mc Graw Hill Pub
7. N.K. De , P.K. Sen "Electric Drives" PHI
8. S.K. Pillai, "A first course of Electrical Drive" New age International.
9. S.K. Pillai. "Analysis of Thyristor Power conditioned Motors" University Press (India)Ltd.
10. Longman P.V. Rao, "Power semiconductor Drives", BS Publications.
11. S.Shiva Nagaraju power semiconductor drive PHI learning

BTEX0703 DIGITAL SIGNAL PROCESSING

Unit- I

Introduction to Digital Signal Processing, Discrete time signals & systems, linear shift invariant systems, stability and causality, Linear-constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, properties of the Discrete Time Fourier transform (DTFT), Sampling and discrete time processing of continuous-time signals.

Unit- II

Applications of z-transforms, solution of difference equations of digital filters, System function, stability criterion, frequency response of stable systems, one sided Z-transform and its applications.

Unit- III

Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences. Discrete Fourier Transforms: Properties of DFT: Fast Fourier Transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms. Inverse FFT.

Unit- IV

IIR DIGITAL FILTERS: Analog filter approximations - Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Bilinear transformation method, step & impulse invariance techniques, Spectral Transformations, Realization of IIR digital filters - direct, canonic, cascade & parallel forms.

Unit- V

FIR DIGITAL FILTERS: Characteristics of FIR Digital Filters frequency response, Design of FIR Digital Filters using Window Techniques. Comparison of IIR and FIR filters, Realization of FIR digital filters - direct, linear phase, cascade & parallel forms.

References:

1. Oppenheim & Schaffer, Digital Signal Processing, PHI.
2. J Cavacchi Digital Signal Processing Wiley India
3. John G. Proakis Digital Signal Processing: Principles, Algorithms, And Applications, 4/E
4. Ludeman Fundamental of Digital Signal Processing, wiley india
5. A. Antoniou, Digital Filters Analysis & Design, TMH
6. A. Anand Kumar Digital Signal Processing ,PHI
7. S.K. Mitra, Digital Signal Processing, TMH

ELECTIVE-I (BTEX-0710(A) – RELIABILITY ENGINEERING)

UNIT-1

Introduction to reliability and indices. Review of probality theory. Density and distribution function of continuous and discrete random variable.

UNIT-II

Component reliability, hazard function, failure laws, exponential failure law, wear in period and its importance. Safety and reliability, replacement, methods of reliability improvement.

UNIT-III

Reliability evaluation of series, parallel, and series–parallel network. Complex network reliability evaluation using event, space, decomposition, tie-set, cut-set and, Satand by system and load sharing system,multi state models.

UNIT-IV

Markov process, State diagram, Availability and unavailability function. Evaluation of time dependent and limiting state probabilities. MTTF calculation. Concept of frequency and durations. State enumeration method for evaluating failure frequency, MUT, MDT,frequency balance approach.

UNIT-V

Reliability testing, estimation of reliability function, failure function and MTTF from grouped and ungrouped datas , censoring and accelerations ,parametric methods.

TEXT BOOKS

1 Introduction to reliability engineering –E.E.Lewis, John Wiely and Sons, 1987
2 Reliability and maintainability engineering, C.E. Ebeling, TMH, 2006

Reference books

1Reliability Engineering : Probability Models and maintanance methods –Joel A.Nochlas,Taylor and Prancis 2005
2 Reliability evaluation of engineering system: concept and techniques-R. Billinton, R.N.Allon, Pitman, 1984

ELECTIVE-I (BTEX-0710(B) – EHV A.C. AND D.C. TRANSMISSION)

Unit- I

Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Converter analysis garetz circuit, Firing angle control, Overlapping.

Unit- II

FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller (UPFC), thyristor controlled phase shifting transformer(TCPST).

Unit- III

Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics misoperation, Commutation failure, Multiterminal D.C. lines.

Unit- IV

Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.

Unit- V

Travelling waves on transmission systems, Their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages

Reference:

1. S. Rao,- "EHV AC & DC Transmission" Khanna pub.
2. Kimbark,-" HVDC Transmission" john willy & sons pub.
3. Arrillaga,- "HVDC Transmission" 2nd Edition ,IEE londan pub.
4. Padiyar, -"HVDC Transmission" 1st Edition ,New age international pub.
5. T.K. Nagsarkar,M.S. Sukhiza, -"Power System Analysis", Oxford University
6. Narain.G. Hingorani, l. Gyugyi-"Undustanding of FACTS concept and technology", john willy & sons pub.
7.P.Kundur- "H.V.D.C. Transmission" McGraw Hill

ELECTIVE-I (BTEX0710(C) – SCADA SYSTEMS AND APPLICATIONS)

Unit I

Introduction to SCADA and PLC:SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.

Unit II

SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.

Unit III

SCADA Architecture-Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.

Unit IV

SCADA Communication-Various industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.

Unit V

Operation and control of interconnected power system-Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation,SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.

Reference Books:

1. Stuart A Boyer: SCADA supervisory control and data acquisition.
2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.
3. Sunil S. Rao, Switchgear and Protections, Khanna Publication.

ELECTIVE-II (BTEX0720(A) – HIGH VOLTAGE ENGINEERING)

Unit -I

Introduction:-Introduction to HV technology, advantages of transmitting electrical power at high voltages, need for generating high voltages in laboratory. Important applications of high voltage.

Unit -II

Breakdown phenomena:- Classification of HV insulating media, Properties of important HV insulating media. Gaseous dielectrics: Ionizations: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory, Limitations of Townsend's theory. Streamer's theory breakdown in non uniform fields. Corona discharges. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquids dielectric dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown.

Unit –III

Generation of HV AC DC and Impulse Voltage and current:- HV AC-HV transformer; Need for cascadeconnection and working of transformers units connected in cascade, Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- Walton type high voltage DC set, Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage, Multistage impulse generator Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Triggering gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current.

Unit –IV

Measurement of high voltages:- Electrostatic voltmeter-principle, construction and limitation. Generatingvoltmeter- Principle, construction. Series resistance micro ammeter for

HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages;Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Surge current
measurement.

Unit –V

High voltage tests on electrical apparatus:-Definitions of technologies, tests on isolators, circuit breakers, cables insulators and transformers.

Reference books:

1. E. Kuffel and W.S. Zaengl, "High voltage engineering fundamentals", 2nd edition, Elsevier, press, 2005.
2. M.S.Naidu and Kamaraju, "High Voltage Engineering", 3rd edition, THM, 2007.
3. L. L. Alston, "High Voltage technology", BSB Publication, 2007..
4. Rakosh Das Begamudre, Extra High voltage AC transmission engineering, Wiley Easternlimited, 1987.
5. Transmission and distribution reference book-Westing House.
6.C.L.Wadhwa, High voltage engineering, New Age International Private limited, 1995.

ELECTIVE-II (BTEX-0720(B) – DIGITAL IMAGE PROCESSING)

Unit-I

Digital Image Processing (DIP)

Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system.

Digital Image Fundamentals: elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

Unit-II

Image Transforms

Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT.

Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

Unit-III

Image Enhancement

Spatial domain methods: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method.

Frequency domain methods: basics of filtering in frequency domain, image smoothing filters (Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

Unit-IV

Image Restoration

Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

Unit-V

Image Compression

Fundamentals of data compression: basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding.

Digital image watermarking, representation and description- minimum perimeter polygons algorithm (MPP).

References:

1. Jain Anil K., "Fundamentals of Digital Image Processing", PHI Learning
2. Rafael, C. Gonzlez., and Paul, Wintz, "Digital Image Processing", Addison-Wesley Publishing Company.
3. Sosenfeld, and Kak, A.C., "Digital Image Processing", Academic Press.
4. William K. Pratt., "Digital Image Processing", John Wiley and Sons.
5. Tamal Bose Digital signal processing wiley india

ELECTIVE-II (BTEX-0720(C) – COMPUTER NETWORKS)

Unit- I

Introduction to computer network, classification of networks (WAN, MAN, LAN), distributed systems, digital signals and data rates, bit stream, symbols and band rate, transmission media, modems, structure of computer network, circuit, packet, message switching topological design, back bone design OSI, reference model.

Unit- II

Physical and data link layer, bit communication between DTE and DCE, RS232C, novel modem Terminal handling, multiplexing and concentration data link layer service and design issues, errors detection and correction, retransmission strategies, sliding window protocols, satellite and packet radio networks, pure aloha protocols, slotted aloha protocol, satellite networks, reservation aloha protocol, DES, PCEM, packet radio networks.

Unit-III

Network layer, basic design issues, network layer services, connection oriented and connection less services, routing, static multipath, centralized isolated distributed hierarchical broadcast, flow based routing, congestion deadlocks radio concept of Ethernet LAN topology and architecture CSMA/CD protocol, token ring LAN token bus LAN, Fiber optic LAN principle of LAN bridges, transparent bridge source routing bridges, gateway, gateway design issues x25 internet working.

Unit-IV

ISDN, B-ISDN and ATM, evolution of ISDN, goal of ISDN services, ISDN system architecture and network terminating devices ISDN interface ISDN signaling, broad band ISDN, Asynchronomous transfer modem ATM adaptation layer, transport layer, OSI transport protocol, session layer designing issues, data exchange OSI session layer primitives, transport protocol TCP

Unit-V

Presentation layer, abstract syntax notation data compressed on oxyptography, application layer OST service elements ACSE and CCR, the transfer access and management, concurrence control nistual terminals, electronic mail directory services distributed systems, formal protocol modules, network management, mobile networking.

Unit-VI

Networking Equipments and Monitoring Tools Routers, Modems, Switches, Gateways, online networking monitoring tools, Network security, Proxy Server design.

References:

1. Tanenbum, Computer Networks, PHI.
2. Keizer, LANs.
3. Stalling W., Computer Networks, PHI.
4. ISDN & Broadband.
5. ISDN: Stalling W., PHI.

BTEX706 – MAJOR PROJECT –I(PLANNING & LITERATURE SURVEY)

The Major Project Work provides students an opportunity to do something on their own and under the supervision of a guide. Each student shall work on an approved project, which may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work involves sufficient work so that students get acquainted with different aspects of manufacture, design or analysis. The students also have to keep in mind that in final semester they would be required to implement whatever has been planned in the Major Project in this semester. It is possible that a work, which involves greater efforts and time may be taken up at this stage and finally completed in final semester, but partial completion report should be submitted in this semester and also evaluated by an external examiner. At the end of semester, all students are required to submit a synopsis.

BTEX0707 – INDUSTRIAL TRAINING

SCHEME OF STUDIES

Duration: 2 weeks after the VI semester in the summer break, Assessment in VII semester.

SCHEME OF EXAMINATION

For the assessment of industrial training undertaken by the students, following components are considered with their weightage.

(a) Term work

In Industry	Marks allotted
1. Attendance and General Discipline	05
2. Daily diary Maintenance	05
3. Initiative and participative attitude during training	05
4. Assessment of training by Industrial Supervisor/s	05
TOTAL	20

(b) Practical/Oral Examination (Viva-Voce)

In Institution	Marks allotted
1. Training Report	10
2. Seminar and cross questioning (defense)	20
TOTAL	30

Marks of various components in industry should be awarded to the students, in consultations with the Training and Placement Officer/Faculty of Institute, Who must establish contact with the supervisor/Authorities of the organisation where, students have taking training to award the marks for term work and I/c of training from Industry. During training students will prepare a first draft of training report in consultation with section in-charge. After training they will prepare final draft with the help of T.P.O./Faculty of the institute. Then they will present a seminar on their training and they will face viva-voce on training in the institute.

1.1 OBJECTIVE OF INDUSTRIAL TRAINING

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World of Work and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

Industrial training of the students is essential to bridge the wide gap between the classroom and industrial environment. This will enrich their practical learning and they will be better

equipped to integrate the practical experiences with the classroom learning process.

1.2 LEARNING THROUGH INDUSTRIAL TRAINING

During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organisational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.
- Quality control and assurance.
- Maintenance system.
- Costing system.
- Stores and purchase systems.
- Layout of Computer/ EDP/MIS centres.
- Roles and responsibilities of different categories of personnel.
- Customer services.
- Problems related to various areas of Work etc.

Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above arena in the field (world of work). Students are supposed to acquire the knowledge on above by -

1. Observation,
2. Interaction with officials at the workplace
3. Study of Literature at the workplace (e.g. User Manual, standards, maintenance schedules, etc.)
4. "Hand's on" experience
5. Undertaking / assisting project work.
6. Solving problems at the work place.
7. Presenting a seminar.
8. Participating in-group meeting/ discussion.
9. Gathering primary and secondary data/ information through various sources, Storage, retrieval and analysis of the gathered data.
10. Assisting officials and managers in their working.
11. Undertaking a short action research work.
12. Consulting current technical journals and periodicals in the library.
13. Discussions with peers.

1.3 GUIDANCE TO THE FACULTY/TPO FOR PLANNING AND IMPLEMENTING THE INDUSTRIAL TRAINING

The industrial training programme, which is spread to 2 weeks' duration, has to be designed inconsultation with the authorities of the work place, keeping in view the need of the contents. Following are some of the salient points:

- Spelling out the objectives of the industrial training in behavioral terms and same is informed in advance to the 1) students, 2) authorities of the work place and 3) supervising faculty members.
- Discussing and preparing students for the training for which meetings with the students has to be planned.

- Meeting with industrial personnel and orienting them regarding the objective of the training and the expectations of the programme.
- Correspondence with the authorities of the work place.
- Orientation classes for students on how to make the training most beneficial - monitoring daily diary, writing weekly reports, how to interact with various categories of industrial personnel, how to behave and undertake responsibilities, how to gather information from the workplace,ethics etc.
- Guiding students to make individual plans (week wise/ day wise) to undertake industrial training
- Developing a system of maintaining training records, by teachers for every batch of students for convenient retrieval.
- Inviting industrial personnel to deliver lectures on some aspects of training.

1.4 ACTION PLAN FOR PLANNING STAGES AT THE INSTITUTION LEVEL

S.No. Activity Commencing Week Finishing week Remarks

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1. Meeting with Principal
2. Meeting with Colleagues
3. Correspondence with work place
(Industries concerned)
4. Meeting with authorities of work place
5. Orientation of students for industrial
training
6. Scrutinizing individual training plan of students
7. Commencement of industrial training
8. First monitoring of industrial training
9. Second monitoring of industrial training
10. Finalization of Training report
11. Evaluation of performance at
Industry level
12. Evaluation of industrial programme in the institution.

1.5 INDUSTRIAL TRAINING DAILY DIARY

Name of the Trainee:……..College:…….. Industry/Work place:……..Week No.:……

Department/Section:……..Date:……

…

---------- Dates

Brief of observations made, work done, problem/project undertaken, discussion held,literature-consulted etc.

BTEX-0801 COMPUTER-AIDED DESIGN OF ELECTRICAL MACHINES

Unit-I

Introduction: Design problem-Mathematical programming methods, computer aided design-Mathematical formulation of the problem. Programming techniques (LP & NLP only), Methods of solution, Unconstrained optimization problems, constrained optimization problems

Unit-II

Optimal design of DC machine:-Design of armature, Windings and field systems, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-III

Optimal design of power transformer:-Design of magnetic circuit, Design of windings, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-IV

Optimal design for 3-phase alternator:-Design of stator, windings, Design of Field systems for salient pole and non-salient pole machines, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-V

Optimal design of 3-phase induction motor:-Design of stator, Windings Design of squirrel cage rotor, Design of slip ring rotor, Selection of variables for optimal design, Formulation of design equations, Objective functions Constraint functions, Algorithms for optimal design.

References:

1. Design and Testing of Electrical Machines,MV Deshpandey PHI Learning
2. Computer- Aided Design of Electrical Equipment- by Dr. M. Ramamoorthy-Affiliated East-West press Pvt. Ltd. New Delhi.
3. Electrical Machine Design- by A.K. Sawhney, Dhanpat Rai & Sons.
4. Principles of Electrical Machine Design with Computer Programmes by- S.K. Sen, Oxford & IBH Publishing Co.
5. Performance and Design of A.C. Machines-M.G. Say, Affiliated East West Press Pvt. Ltd., New Delhi.

BTEX-0802COMPUTER APPLICATIONS TO POWER SYSTEMS

Unit-I

Models of power system components, network model using graph theory, formation of Z bus, transmission line models, regulating transformer, line loadability, capability curves of alternator.

Control of load bus voltage using reactive power control variable, SVC & SVS, Regulated shunt compensation, series and shunt compensation, Uniform series and shunt compensation and effect on loadability of transmission lines.

Unit-III

Sensitivity analysis- General sensitivity relations, generation shift distribution factors, line outage distribution factors, compensated shift factors, sensitivity associated with voltage-VAR, sensitivities relating load bus voltage changes in terms of PV bus voltage changes, sensitivity relating changes in reactive power generation for changes in PV Bus Voltage.

Unit-IV

Power system security - Security functions, Security level, contingency analysis, security control, economic dispatch using LP formulation, pre-contingency and post- contingency, corrective rescheduling.

Unit-V

Voltage stability - Difference between voltage and angle stability, PV Curve for voltage stability assessment, proximity and mechanism, modal analysis using reduced Jacobian, participation factor, effect of series and shunt compensation on voltage stability , effect of load models.

References:

1. Computer Modeling of Electrical Power Systems, Arrillaga J. watson N R Wiley India
2. A Chakrawarti Power System Analysis: Operation and Control PHI Learning 3rd edition
3. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
4. Computer Techniques in Power Systems Analysis- Pai M.A. Tata Mc Graw Hill.
5. Computer Aided Power Systems Analysis Kusic G.L. 2nd Edition, CRC Press
6. Modern Power Systems Analysis Nagrath I.J. and Kothari D.P. Tata Mc Graw Hill.
7. Power System Analysis Grainger J.J. & Stevnson W.D. Mc Graw Hill.
8. Power System Stability and control -P Kundur ,IEEE Press 1994.
9. Advance Power Systems Analysis and Dynamics Singh L.P. John Wiley.

BTEX-0830(A) ADVANCED POWER ELECTRONICS

UNIT- 1

Introduction to various power electronics supplies. Performance parameters for power electronics supplies and their measurement. Device selection, Control circuits. Switch mode power supplies, Square wave switching, Resonant mode operation of Power supplies , Ferroresonant, Linears and the switchers.

UNIT- 2

DC to DC Converters: Analysis and design of buck, boost, buck-boost and cuk converters, two quadrant and full bridge converters. Isolated converters i.e., flyback, forward and bridge topology. Design of d.c. inductor. Concept of integrated magnetics, converter control, averaged model, state-space model.

UNIT- 3

DC to Controlled AC: Controlled inversion, three phase full bridge inverters. 180 mode and 120 mode operation, harmonic analysis, PWM control of VSI, current mode control of PWM VSI, space vector modulation, three phase current sourced PWM CSI,

UNIT- 4

AC Choppers: Modeling and analysis of AC choppers, harmonics control using symmetrical and asymmetrical waveform pattern,

UNIT- 5

Soft switching DC to DC converters, zero current switching topologies, zero voltage switching topologies, generalized switching cell, ZCT and ZVT DC converters,

Text Books:

1. “Power Electronics Circuits”, Issa Batarseh, John Wiley & Sons Inc., 2004.
2. “Power Electronics: ”, L.Umanad, Wiley India.
3. “Power Electronics: Converters, Applications, and Design”, Ned Mohan, John Wiley & Sons Inc., 2001.
4. “Power Electronics: Devices and Circuits”, Jagannathan, PHI Learning 2012

Reference Books:

1. “Power Electronic Systems Theory and Design”, Jai P Agrawal, Pearson Education Asia, 2001.
2. “Switching Power Supply Design”, A I Pressman, McGraw Hill Publication, 1991.
3. “Handbook of Power Electronics”, M H Rashid

BTEX-0830(B) ADVANCED COMMUNICATION SYSTEMS

Unit-I

Course Contents

Introduction to spread spectrum modulation, Direct sequence (DS) spread spectrum, Spread spectrum with code division multiple access (CDMA), Ranging, Frequency hopping (FH) spread spectrum, PN sequence generation, Acquisition and tracking of FH signal and DS signals.

Unit-II

Satellite communication: Introduction to satellite communication, Frequency allocation active/passive synchronous ,Non synchronous systems, Orbits satellite attitude, Transmission path, Path loss, noise consideration link analysis, Satellite systems effective isotropic radiated power, Multiple access methods, Earth stations, Tracking and servo system, Up-down converters, Example of satellite systems.

Unit-III

Digital switching systems: Introduction to electronics and digital exchanges, Hierarchy of switching offices, Common control push button dialing systems, Switching matrix multiple stage switching time division multiplexing time slot interchanging (TSI), Comparison of TSI with space switching, Space array for digital signals, Combined space and time switching. Principles of FAX.

Unit-IV

Mobile communication: Introduction to cellular mobile communication element of the cellular systems, Cell design, hand off techniques, Frequency Management.

Unit-V

Local access networks: Improvement in convention cables: XDSL, ADSL, Wireless local loop, Fiber in local loop, radio Trunking. ISDN: Architecture, Services and Protocols, ATM networks

References:

1. Radio Callins, Microwave communication.
2. Gagldardi, Satellite communication.
3. Thyggajan Vishwanathan, Tele Communication switching systems – PHI Learning
4. Lee, Cellular and mobile communication
5. Karmilo Fehar, Wireless digital communication. - PHI Learning

BTEX-0830(C) FACTS

UNIT I

Basic Issues Involved in Bulk Power Transmission, Review of basics of power transmission networks-control of power flow in AC transmission line- Analysis of uncompensated AC Transmission line- Passive reactive power compensation, Principle of Transmission system compensation, Need for FACTS controllers- types of FACTS controllers and Benefits

UNIT II - STATIC VAR COMPENSATOR (SVC) and Purpose

Voltage control by SVC – Advantages of slope in dynamic characteristics- Influence of SVC on system voltage, Design of SVC voltage regulator, Modeling of SVC for power flow and stability studies, Applications- Enhancement of transient stability, Steady state power transfer, Enhancement of Power system damping, Prevention of voltage instability

UNIT III - THYRISTOR AND GTO THYRISTOR CONTROLLED SERIES CAPACITORS (TCSC and GCSC)

Concepts of Controlled Series Compensation –Analysis of TCSC-GCSC , Different modes of operation, Modeling of TCSC and GCSC for load flow studies- modeling TCSC and GCSC for stability studies- Applications of TCSC and GCSC, SSR mitigation.

UNIT IV - VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS

Static synchronous compensator(STATCOM)- Static synchronous series compensator(SSSC)- Operation of STATCOM and SSSC-Power flow control with STATCOM and SSSC- Modeling of STATCOM and SSSC for power flow studies –operation of Unified and Interline power flow controllers(UPFC and IPFC).

UNIT V - CONTROLLERS AND THEIR CO-ORDINATION

FACTS Controller interactions – SVC–SVC interaction - co-ordination of multiple controllers using linear control techniques – Quantitative treatment of control coordination.

References-

1. Mohan Mathur, R., Rajiv. K. Varma, Thyristor – Based FACTS Controllers for Electrical Transmission Systems, IEEE press and John Wiley & Sons, Inc, 2002.
2. K.R.Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International (P) Ltd., Publishers, New Delhi, Reprint, 2008.
3. A.T.John, Flexible AC Transmission System, Institution of Electrical and Electronic Engineers (IEEE), 1999.
4. NarainG.Hingorani, Laszio. Gyugyl, Understanding FACTS Concepts and Technology of Flexible AC Transmission System, Standard Publishers, Delhi, 2001.
5. V. K.Sood, HVDC and FACTS controllers- Applications of Static Converters in Power System, Kluwer Academic Publishers, 2004.

BTEX0840(A) POWER SYSTEM ECONOMICS

UNIT -1

Power System Fundamentals

Regulation and Deregulation, condition for deregulation, problems with regulation, risk management, congestion management, ATC, screening curve.

Unit-2

Competetions In Power Market

What is competition, efficiency of perfect competition, marginal cost in power market, role of marginal cost, working with marginal cost, results of marginal cost.

UNIT -3

Market Power And Structure

Define market power, price quality outcomes, three stages of market power, using price quality outcomes to show power, monopoly in power auction, market power on demand side.

UNIT- 4

Restructure

Fundamental restructure system, transmission pricing, restructure models, OASIS, structure of OASIS, transfer capability of OASIS.

UNIT -5

Designing And Testing Market Rules

Design for competitive prices, testing of market design, designing to reduce market power.

REFERENCES:

1- Power system economics-designing for electricity-steven stoft. (IEEE press & WILEY-INTERSCIENCE).

2- Electric Power Systems weedy,cory, wily india 2nd edition

BTEX0840(B) CELLULAR MOBILE COMMUNICATIONS

Unit-I

Introduction to cellular mobile system

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system.

Elements of cellular radio system design

General description of problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I in an omni-directional antenna system, hand off mechanism, cell splitting, components of cellular systems.

Unit-II

Cell coverage for signal and traffic

General introduction, mobile point-to-point model, propagation over water or flat open area, foliage loss, propagation in near- in distance, long distance propagation, path loss from point-to-point prediction model, cell site antenna heights and signal coverage cells, mobile-to-mobile propagation.

Cell site antennas and mobile antennas

Equivalent circuits of antennas, gain and pattern relationship, sum and difference patterns, antennas at cell
site, unique situations of cell site antennas, mobile antennas.

Unit-III

Cochannel interference reduction

Cochannel interference, real time cochannel interference measurement at mobile radio transceivers, design of antenna systems - omni directional and directional, lowering the antenna height, reduction of cochannel interference, umbrella- pattern effect, diversity receiver, designing a system to serve a predefined area that experiences cochannel interference.

Types of Noncochannel interference

Adjacent channel interference, near-end-far-end interference, effect on near-end mobile units, cross-talk, effects of coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell site components, interference between systems, UHF TV interference, long distance interference.

Unit-IV

Frequency management and Channel Assignment

Frequency management, frequency spectrum utilization, setup channels, channel assignment, fixed channel assignment, non-fixed channel assignment algorithms, additional spectrum, traffic and channel assignment, perception of call blocking from the subscribers

Handoffs and dropped calls

Value of implementing handoffs, initiation of handoff, delaying a handoff, forced handoff, queuing of handoff, power- difference handoff, mobile assisted handoff and soft handoff, cell-site handoff and intersystem handoff, dropped call rate formula.

Unit-V

Digital Cellular Systems

GSM- architecture, layer modeling, transmission, GSM channels and channel modes, multiple access scheme.

CDMA- terms of CDMA systems, output power limits and control, modulation characteristics, call processing, hand off procedures.

Miscellaneous mobile systems- TDD systems, cordless phone, PDC, PCN, PCS, non cellular systems.

References:

1. Lee: Cellular and Mobile Telecommunication- Analog & digital systems, TMH.
2. Rappaport: Wireless Communications- principles and practice, Pearson Education.
3. Lee: Mobile communications design fundamentals, Wiley India.
4. Faher Kamilo: Wireless Digital Communication, PHI Learning.
5. Raj Kamal: Mobile Computing, Oxford University Press.

BTEX0840(C) ADVANCED CONTROL SYSTEM

UNIT-I

Review of Linear Control System: Modelling through differential equations and difference equations, State space method of description and its solution, Discretization of continuous-time state space model, Laplace and z-domain analyses of control systems, Controllability, Observability & Stability, Bode & Nyquist analysis, Root Loci, Effect of load disturbance upon control actions.

UNIT-II

Development of feedback control laws through state space technique, Modal control, Pole placement problem.

UNIT-III

Variable Structure Control and its applications. Examples on variable structure control.

UNIT-IV

Control of nonlinear dynamics: Lyapunov based control function, Phase plane technique, Lyapunov Stability analysis.

UNIT-V

Optimal Control: Calculus of variation, Euler-Lagrange equations, Boundary conditions, Transversality condition, Bolza problem, Pontyagin's maximum principle.

Reference:

1. Automatic Control System – B.C. Kuo, PHI, New York, 1975.
2. Modern Control Engineering: K. Ogata,PHI. New Delhi, 1992.
3. Digital Control Systems – B. C. Kuo, Oxford Pub.
4. Discrete-Time Control Systems – K. Ogata. PHI. New Delhi
5. Advanced Control Systems N Sarkar PHI Learning
6. Control System Engineering S NISE Wiley India

BTEX-0803 MAJOR PROJECT

GUIDELINES

The objectives of the course 'Major Project' are

- To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
- To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
- To give students an opportunity to do some thing creative and to assimilate real life work situation in institution.
- To adapt students for latest developments and to handle independently new situations.
- To develop good expressions power and presentation abilities in students.

The focus of the Major Project is on preparing a working system or some design or understanding of a complex system using system analysis tools and submit it the same in the form of a write-up i.e. detail project report. The student should select some real life problems for their project and maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan. Each student is required to prepare a project report and present the same at the final examination with a demonstration of the working system (if any).

The faculty and student should work according to following schedule:

i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.

ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.

iii) At all the steps of the project, students must submit a written report of the same.

BTEX -804 - MODELLING & SIMULATION LAB

1. Study of various Electrical Toolbox i.e Power System,Power Electronics, Control system, Electrical Measurement ,Flexible AC Transmission.
2. Developing Simulation Models for single and three phase Rectifier, Inverter, and Converter for different load models.
3. Developing Simulation Models using FACTs Devices i.e STATCOM, SVC, TCSC,SSSC, IPFC, UPFC in power system transmission lines.

REFERENCE

1. Shailendra Jain "Modeling **and Simulation** using **MATLAB Simulink"** wiley india & sons