Faculty of Engineering & Technology

Study and Evaluation Scheme

Of

Bachelor of Technology

B.Tech. – Electrical Engineering

III & IV Year

(Applicable w.e.f Academic Session 2013-16 till revised)

AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

**** The University Authorities reserve all the rights to make any additions/ deletions or changes/ modifications to this syllabus as deemed necessary.**

Faculty of Engineering & Technology
Department of Electrical Engineering

B.Tech

(Electrical Engg.)

V Semester

TEACHING & EXAMINATION SCHEME

S.No.	Paper Code	Subjects	L	T	P	Credit	Total Credit
1.	03EE501	Analog And Digital Communication	3	1		4	26
2.	03EE502	Analog And Digital Electronics	3	1		4	
3.	03EE503	Electronic Instrumentation	3	1		4	
4.	03EE504	Power Electronics	3	1		4	
5.	03EE505	Switchgear And Protection	3	1		4	
1.	03EE551	Analog And Digital Electronics (Lab)			2	1	
2.	03EE552	Electronic Instrumentation (Lab)			2	1	
3.	03EE553	Switchgear And Protection (Lab)			2	1	
4.	03EE554	Power Electronics (Lab)			2	1	
5.	03EE555	Simulation Lab (MATLAB)			2	1	
6	03EE556	Analog And Digital Communication (Lab)			2	1	

Faculty of Engineering & Technology
Department of Electrical Engineering

B.Tech (Electrical Engg.)

VI Semester

TEACHING & EXAMINATION SCHEME

S.No.	Subject Code	Subject Name	L	T	P	Credit	Total Credit
1.	03EE601	Electrical Drives	4	1		5	27
2.	03EE602	Electrical Machine Design	4	2		5	
3.	03EE603	Control Systems	4	1		5	
4.	03EE604	Microprocessor And Microcontroller	4	1		5	
5.	03EE605	Signal And System	3	1		4	
1.	03EE651	Electrical Drives (Lab)			2	1	
2.	03EE653	Control Systems (Lab)			2	1	
3.	03EE654	Microprocessor And Microcontroller (Lab)			2	1	

Faculty of Engineering & Technology
Department of Electrical Engineering

B.Tech (Electrical Engg.)

VII Semester

TEACHING & EXAMINATION SCHEME

S.No.	Subject Code	Subject Name	L	T	P	Credit	Total Credit
1.	03EE701	Energy Conservation And Management	3	1		4	30
2.	03EE702	Power System Analysis And Control	4	1		5	
3.	03EE703	Utilization Of Electrical Power	4	1		5	
4.	**Elective-1**		4	1		5	
	03EE704-C	**Flexible AC Transmission System**					
5.	**Elective-2**		4	1		5	
	03EE705-B	**Generalizaed Theory of Machines**					
1.	03EE751	Power System Analysis And Control (Lab)			2	1	
2.	03EE752	Major Project (Planning And Literature Survey)			8	4	
3.	03EE753	Industrial Training (2 weeks)			2	1	

Faculty of Engineering & Technology
Department of Electrical Engineering

B.Tech (Electrical Engg.)

VIII Semester

TEACHING & EXAMINATION SCHEME

S.No.	Subject Code	Subject Name	L	T	P	Credit	Total Credit
1.	03EE801	Computer Aided Machine Design	4	1		5	29
2.	03EE802	Power System Planning And Reliability	4	1		5	
3.		Elective-3	3	1		4	
4.		Elective-4	3	1		4	
1.	08EE851	Major Project			16	8	
2.	08EE852	Modelling And Simulation Lab			6	3	

B.Tech. (Electrical Engineering)
V Semester
ANALOG AND DIGITAL COMMUNICATION

Unit-I

Introduction to Communication Systems: Block diagram, modulation and demodulation, need for modulation, transmission considerations and decibel ratios.

Amplitude modulation, generation of AM waves, concept of SSB and DSB modulation, vestigial sideband transmission, power-relationships, AM receivers, S/N ratio.

Unit-II

Phase and frequency modulation, pre-and de-emphasis, generation of FM waves, CW modulation systems, narrowband FM, FM detectors and superheterodyne receivers, S/N ratio.

Concepts of information, Shannon-Hartley theorem, bandwidth-S/N ratio tradeoff, coding, codes for error detection and correction, convolution codes, block and trellis codes.

Unit-III

Pulse modulation, PAM, PPM, PWM systems. Concept of PCM, basic coding and quantization, sample and hold, quantization noise, signal to noise ratio, companding, TDM, Delta modulation, adaptive delta modulation, S/N ratio, comparison of PCM, delta and adaptive delta modulation

Unit-IV

ASK, PSK, FSK, differential PSK and quadriphase shift keying, synchronization concepts and phase locked loops. Digital modulation techniques, Generation, Detection, equation and bandwidth of amplitude shift keying(ASK) Binary phase shift keying(BPSK), Differential phase shift keying(DPSK),M-Ary PSK, Binary Frequency shift keying(BFSK), M-Ary FSK Quadrature Amplitude modulation(QAM), MODEM, Introduction to probability of error.

Unit-V

Block diagram of Fibre optic communication systems, light propogation in optical fibres, numerical aperature and acceptance cones of OFs, losses in optical fibres.

Multiplexing in optic Fibre links. An introduction to telephone exchange systems. Telecommunication traffic, circuit switching, message switching and packet switching. Resource sharing and multiple access techniques. An introduction to microwave, radar and satellite communication.

List of Experiments:-

1. Study of sampling process and signal reconstruction and aliasing.
2. Study of PAM PPM and PDM.
3. Time division multiplexing (TDM) and De multiplexing
4. Study of ASK PSK and FSK transmitter and receiver.
5. Study of AM modulation and Demodulation techniques (Transmitter and Receiver) Calculate of parameters.
6. Study of FM modulation and demodulation (Transmitter and Receiver) & Calculation of parameters.
7. Study of PCM transmitter and receiver.
8. Study of AVC and AFC.
9. Study of super hetrodyne receiver and characteristics of ratio radio receiver.

References:

1. Simon Haykins, Communication System. John Willy
2. Wayne Tomasi, Electronic Communication system..

Textbooks:

1.Singh & Sapre, Communication System, TMH
2. B.P. Lathi, Modern Digital and analog communication system.

B.Tech. (Electrical Engineering)
V Semester
ANALOG & DIGITAL ELECTRONICS

Unit-I Analog
Transistor biasing circuits: CE, CC & CB amplifiers, Darlington amplifier. Hparameters and their application in analysis. Class A, B, C, D and S power amplifiers. Pushpull operation. JFET: Biasing and CS, CD and CG amplifier. MOSFET: Depletion type, Enhancement type MOSFET and their biasing.

Unit-II
OP-AMP, Differential amplifier and its DC, AC analysis, OP-AMP characteristics, Non-Inverting/Inverting Voltage and Current feedback. Regulated power supplies; Oscillators and Timer (555)

Unit-III Digital*:*
Logic gates and Logic Families: Logic gates, Universal gates, transistor as a switching element, Combinational Logic gates Introduction to combinational circuits, arithmetic and logical operation, design of Half adder & full adder, subtractor circuits, parity generator & and checker, code converter, decoders, multiplexers, demultiplexers, comparators.

Unit-IV
Sequential Circuits- Flip-flops, bistable circuits: RS, JK, D, T, Master/Slave Flipflop, race around condition, latches, synchronous and asynchronous counters up & down counters, shift registers, state transition diagram

Unit-V
A/D & D/A Converters- D/A converter, accuracy, resolution and precision,
variable resistor network, binary ladder, A/D converter, accuracy and resolution,
simultaneous conversion, counter method, continuous A/D converter, dual slope, successive approximation method.

List of Experiments*:*
1. Study the diode clipping circuits.
2. Study the diode clamping circuits.
3. Study Zener diode as voltage regulator.
4. Study the common emitter configuration of a transistor.
5. Study the common base configuration of a transistor.
6. Study the common collector configuration of a transistor.
7. Study FET as (a) A source follower (b) A voltage variable resistor.
8. Study FET as (a) A chopper (b) A constant current source.
9. Study the following mathematical operations using Op-Amps:- (a) Addition (b) Subtraction (c) Multiplication (d) Division (e) Integration (f) Differentiation
10.Study the Op-Amp as wave form Generator: (a) Astable Multivibrator (b) Triangle Wave Generator (c) Schmitt Trigger

Text/Reference Books:

Analog:

1. Millman and Halkias, “Integrated Electronics”, Mc Graw Hill.
2. R. Boylested and L. Nashelsky, “Electronics Devices and Circuits”, Prentice Hall India.
3. Millman and Halkias, “Electronics Devices and Circuits”, TMH Edition.
4. Malcolm Goodge, “Analog Electronics Analysis and Synthesis”, TMH Edition.
5. Malvino, “Electronics Principles”, TMH Edition.

Digital:

1. RP Jain, „Modern Electronics“.
2. AP Malvino and DP Leach, „Digital Principles and applications“.
3. Floyd, „Digital Circuits“.
4. Charles Roth, „Fundamentals of Logic Design“.
5. H. Taub and D. Schilling, „Digital Integrated Electronics“.
6. Gothman, “Digital Electronics”.

B.Tech. (Electrical Engineering)
V Semester

ELECTRONIC INSTRUMENTATION

Unit-I

Introduction to 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.

Unit-III Transducers

Transducers definition and classification, mechanical devices as primary detectors, 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. 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

Unit-IV 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-V 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 VM. , compression of Electronic & Digital Volt meter, 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, X-Y recorders.

Instruments used in computer-controlled instrumentation RS 232C and IEEE 488, GPIB electric interface.

List of Experiments:-

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

References:

1.H.S.Kalsi., Electronic Instrumentation, TMH.
2.E.W. Golding, Electrical Measurement and Measuring Instruments Sir Isaac Pitman and Sons, Ltd. London 1940

Textbooks:

1. A.K. Sawhney, Electrical and Electronic measurements and Instrumentation, Dhanpat Rai and Co.

B.Tech. (Electrical Engineering)
V Semester
POWER ELECTRONICS

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 techniques (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. Study the performance of single-phase half-wave and full-wave uncontrolled rectifiers.
2. Study different firing circuits of SCR.
3. Study forced commutation circuits of SCR.
4. Study protection circuits of SCR: (i) dv/dt (ii) di/dt (iii) Over voltage (iv) Over current .
5. Study the characteristics of a Thyristor and a Triac.
6. Study firing circuit of SCR using ramp-comparator scheme.
7. Study firing circuit of SCR using cosine-wave scheme.
8. Study firing circuit of SCR using Op-amps and Gates.
9. Study digital firing circuit of SCR.
10. Study operation of Triac in all four modes and study AC phase control using Triac.

References:

1. Power electrics : Circuits, devices & applications,
   M. H. Rashid, PHI
2. Power Electronics, P.C. Jain, TMH

Textbooks:

1. P.C. Sen, Power Electonics, TMH
2. Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub.

B.Tech. (Electrical Engineering)
V Semester
SWITCHGEAR AND PROTECTION

Unit-I

Switchgear- Introduction, functions of a circuit breaker, contacts separation and arc phenomenon, theory of arc formation and its extinction, recovery voltage, restriking voltage, interruption of capacitive and inductive currents, resistance switching, double frequency transients, circuit breaker ratings, clearing time, reclosing time, classification of circuit breakers, oil, air-blast, vacuum and SF6 circuit breakers.

Unit-II

Protection Against Lightning- Lightning mechanism and its characteristics, over- voltages due to lightning, protection of lines and sub-stations against lightning using shield wires, tower footing resistance, counterpoises, ground wires, rod gaps, lightning arrestors, their construction, working and ratings, surge absorbers and surge divertors.

Unit-III

Insulation Co-ordination: Impulse volt-time characteristics of electrical apparatus, basic impulse insulation level, insulation levels of sub-station equipments

Unit-IV

Protective Relays: Introduction, basic requirements, operating principles and characteristics of electromagnetic type over-current, differential, impedance and admittance relays. Detail of protection against abnormal conditions for alternators, transformers, feeders transmission lines, and bus-bars. Carrier current protection for long lines.

Unit-V

Static Relays: Introduction, comparison with electromagnetic relays, working of instantaneous, definite time, inverse time and directional over current relays, introduction to digital relays.

List of Experiments:

Operating Characteristics of

1. Over Voltage Relays
2. IDMT Relays
3. Percentage based differential relays
4. Buchholz relays .
5. Solid state over current relays

References:

1. Sunil S. Rao , Switchgear and protection.
2. Badriram & Vishwakarma, Power System Protection

Textbooks:

1. IJ Nagrath and DP Kothari,"Power System Engineering" Tata McGraw-Hill.
2. CL Wadhwa, "Electric Power Systems", Wiley Eastern Limited.

B.Tech. (Electrical Engineering)
V Semester
SIMULATION LAB

LIST OF EXPERIMENT

1. Study of MATLAB and its Application.
2. To generate the sinusoidal and co sinusoidal pulse with the help of MATLAB.
3. To find the time response for series RLC circuit.
4. To plot output waveform of MOSFET.
5. To generate the pulse with the help of PWM techniques.
6. To Analyze the operation of single phase half wave rectifier supply resistive, inductive loads.
7. To model and simulate the single phase full wave controlled bridge rectifier fed separately excited DC motor by using MATLAB/SIMULINK.
8. To observe the waveform of single phase semi convertor circuit with RL load.
9. To observe the waveform of ASK, FSK and PSK using MATLAB.
10. To observe the waveform of Clipper and Clamper Circuit
11. To observe the waveform of single phase half wave AC VOLTAGE CONTROLLER
12. To observe the load current ,voltage and speed waveform of Asynchronous Machine
13. To observe the waveform of single phase full wave rectifier circuit with R load
14. To observe the waveform of single phase half wave thyristor circuit with R load
15. To observe the waveform of single phase semi convertor circuit, when one of the thyristor is replaced by diode

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

B.Tech (Electrical Engg.)
Semester-VI
ELECTRICAL DRIVES

UNIT-I

Introduction- Classifications of Electric Drives, components of electric drives, advantages of electric drives, Review of characteristics and speed control of d.c. and a.c. motors. Dynamics of Electric Drives:- Fundamental torque equation, speed-torque conventions and multiquadrant operation, equivalent values of drive parameters, components of load torques, nature and classification of load torques, calculation of time and energy-loss in transient operations, criteria for steady state stability, load equalization.

UNIT-II

Rating and Heating of Motors- Thermal model of motor for heating and cooling, classes of motor duty, determination of motor rating, frequency of operation of motors subjected to intermittent loads.

UNIT-III

Rectifier Control of D.C. Drives- Controlled rectifier circuits, 1-phase fully controlled rectifier-fed separately excited d.c. motor, 3-phase fully controlled rectifier-fed separately excited d.c. motor, multi quadrant operation of fully-controlled rectifier-fed d.c. motor. Chopper Control of D.C. Drives- Principle of operation and control techniques, motoring operation of separately excited and series excited motors, multi quadrant control of chopper-fed motors.

UNIT-IV

Induction Motor (IM) Drives:- 3-phase a.c. voltage controller-fed IM drive, voltage source inverter (VSI) and current source inverter (CSI) variable frequency drives, comparison of VSI and CSI drives, cyclo-converter-fed IM drive, static rotor resistance control of 3-phase slipring IM.

UNIT-V

Synchronous Motor Drives- VSI drive, CSI drive, CSI drive with load commutation, cyclo-converter drive, Braking methods- Various methods of braking d.c. and a.c. motors, regenerative braking of d.c. motors during chopper control, static scherbius drive, commutatorless Kramer drive. Introduction to Microprocessor Control of Electric Drives.

Reference Books:

1. V. Subrahmanyam, " Electric Drives: Concepts and Applications", Tata Mc Graw Hill Publishing. 2. G.K. Dubey, " Power Semiconductor Controlled Drives, "Prentice Hall, Englewood cliff.

Text Book:

1.G.K. Dubey, "Fundamentals of Electrical Drives" Narosa Publishing House.
2. P. C. Sen, "Thyristor dc Drives", Wiley International.

List of Experiments (Using MAT LAB):

1. Study speed control of separately excited dc motor by varying armature voltage using single-phase fully controlled bridge converter.
2. Study speed control of separately excited dc motor by varying armature voltage using single phase half controlled bridge converter.
3. Study speed control of separately excited dc motor using single phase dual converter (Static Ward- Leonard Control)
4. Study speed control of separately excited dc motor using MOSFET/IGBT chopper
5. Study closed loop control of separately excited dc motor
6. Study speed control of single phase induction motor using single phaseac voltage controller.
7. Study speed control of three phase induction motor using three phase ac voltage controller.
8. Study speed control of three phase induction motor using three phase current source inverter
9. Study speed control of three phase induction motor using three phase voltage source inverter.
10. Study speed control of three phase slip ring induction motor using static rotor resistance control using rectifier and chopper

B.Tech (Electrical Engg.)
Semester-VI
ELECTRICAL MACHINE DESIGN

UNIT-I

Introduction: Review of Magnetic and insulating materials. Review of Magnetic and Electrical Quantities, Force and Torque Determination (Mathematical Analysis), Factors and limitations in design, specific magnetic and electric loadings, Real and apparent flux densities.
Heating, Cooling and Ventilation.

UNIT-II

Design of Transformers: General considerations, output equation, main dimensions, leakage reactance, winding design, tank and cooling tubes, calculation of magnetizing current, losses, efficiency and regulation.

UNIT-III

Design of DC Machines: Output Equations, Main Dimensions, Magnetic Circuit Calculation, Carter's Coefficient, Net length of Iron, Selection of No.of Poles, Design of Armature, Design of Commutater and Brush.

UNIT-IV

Design Three-phase induction motors: General considerations, output equation, choice of specific electric and magnetic loadings, No. of slots in stator and rotor, elimination of harmonic torques, design of stator and rotor windings, leakage reactance, equivalent resistance of squirrel cage rotor, magnetizing current, temperature rise and efficiency.

UNIT-V

Design of Alternators: Classification and their comparison, specific loadings, output coefficient, main dimensions, short circuit ratio, elimination of harmonics in generated EMF, stator winding design. Introduction to computer aided electrical machine design.

Reference Books:

1. Clayton A.E., "The performance and design of D.C. Machines".
2. Say MG, "The performance and design of A.C. Machines".

Text Book:

1. Sawhney AK, "Electrical Machine Design", Dhanpat Rai & Sons.

B.Tech (Electrical Engg.)
Semester-VI
CONTROL SYSTEMS

UNIT-I

Introduction to Control Systems- Concept of control, control system terminology, classification of Control Systems.Mathematical Models of Systems- Differential equations of physical systems, transfer function of physical systems, block diagram models, signal flow graph, mason's gain formula . D.C. & A.C. Servomotors, tachometer, potentiometer, Synchros.

UNIT-II

Time Domain Analysis: standard test signal, type & order, steady state response analysis, steady state error for different type of inputs and different type of system, relation between static and dynamic error constant. transient state analysis, second order system, effect of damping on nature of response.

UNIT-III

Stability in time domain: Impulse response and stability, Routh Hurwitz criteria, difficulties and limitations of routh array. Root locus technique: analysis of system having dead time or transportation lag, root contours. effects of feedback: sensitivity analysis, root sensitivity. Industrial controllers: proportional mode, integral mode, derivative mode. Composite controller mode: PI mode, PD mode, PID mode. Introduction of compensators: lead compensator, lag compensator, lead-lag compensator.

UNIT-IV

Frequency domain analysis: frequency domain specification: resonant frequency, peak magnitude, bandwidth, cut off frequency, stability criteria. Polar plot: general shapes of polar plot, effect of zeroes on polar plot, stability from polar plot, concept of enclosement and encirclement. Nyquist plot: nyquist stability criteria. Bode plot: system gain, integral & derivative factor, first order factor, quadratic factor, bode plot for lead lag compensator. Inverse bode plot. M & N circles.

UNIT-V

State space analysis: state model from differential equation, STM, transfer function from state model, stability for state model, controllability, observability, solution of state equation, state diagrams

Reference Books:

1. I.J.Nagrath and M.Gopal, "Control System Engg", TMH.
2. M.Gopal, "Control Systems Principles and Design", TMH.

Text Book:

1. K. Ogata, " Modern Control Engineering", PHI.
2. B.S.Manke " Linear Control System", Khanna publication

List of Experiments:

1. Study time response of second order system.
2. To study characteristics of Synchros.
3. To study effect of feedback on servomotors.
4. Determination of transfer function of A-C servomotor
5. Determination of transfer function of D-C servomotor.
6. Formulation of PI & PD controller and study of closed loop responses of 1st and 2nd order dynamic systems.

B.Tech (Electrical Engg.)
Semester-VI
MICROPROCESSOR AND MICROCONTROLLER

UNIT-I

Microprocessor Architecture-8085 microprocessor architecture, timing and control unit, machine cycles, interrupt diagram. Architecture of 8086 microprocessor

UNIT-II

Programming- Addressing modes, instruction set, assembly language programming, program for multi byte addition/subtraction, multiplication, division, block transfer.

UNIT-III

Interfacing- Basic principles of interfacing memory and I /O devices. Data transfer techniques – programmed interrupt and DMA. Details of interfacing devices 8255 and 8253. Interfacing of D/A and A/D converter.

UNIT-IV

Semi Conductor Memory- Read only memories, random access memories. Interfacing of memories with 8085/86.

UNIT-V

Microcontroller- Architecture of 8051 microcontroller. Interrupt, serial and timer control. Instruction set and programming. Interfacing with D/A and A/D converter. Applications of microprocessors and microcontrollers.

Reference Books:

1. R.S. Gaonkar, "Microprocessor Architecture, Programming and Applications.
2. K.J. Ayala, "8051 Microcontroller", Penram International.

Text Book:

1.Ray A.K., Bhurchandi K.M. "Advance Microprocessor and peripheral", first edition, TMH.

List of Experiment:

1.Familiarization with 8085/86 Microprocessor and 8051 Microcontroller kit.
2.Write program for display of 24 hour clock on 8085 mp kit.
3.To generate square wave, saw tooth, triangular wave of 1KHz frequency and 50% duty cycle using 8051 kit.
4.To develop and run a program for arranging in ascending/descending order of a set of numbers
5.To obtain interfacing of keyboard and DMA controller
6.To perform microprocessor based traffic light control operation through 8085 kit

B.Tech (Electrical Engg.)
Semester-VI
SIGNAL AND SYSTEM

UNIT-I

Dynamic Representation of Systems: Systems Attributes, Causality linearity, Stability, time invariance.Special Signals, Complex exponentials, Singularity functions (impulse and step functions).. Linear Time-Invariant Systems: Differential equation representation convolution Integral. Discrete form of special functions. Discrete convolution and its properties. Realization of LTI system (differential and difference equations).

UNIT-II

Fourier Analysis of Continuous Time Signals and Systems : Fourier Series, Fourier Transform and properties, Parseval's theorem, Frequency response of LTI systems. Sampling Theorem.

UNIT-III

Fourier Analysis of Discrete Time Signals & Systems : Discrete-Time Fourier series, Discrete-Time Fourier Transform (including DFT) and properties. Frequency response of discrete time LTI systems.

UNIT-IV

Laplace Transform: Laplace Transform and its inverse: Definition, existence conditions, Region of Convergence and properties, Application of Laplace transform for the analysis of continuous time LTI system (stability etc.) Significance of poles & zeros.

UNIT-V

Z-Transform : Z-Transform and its inverse: Definition, existence, Region of convergence and properties, Application of Z-Transform for the analysis of Discrete time LTI Systems, Significance of poles and zeros.

Reference Books:

1.Simon Haykin, Communication Systems, 3rd Edition, John Wiley.
2. Alan V. Oppenheim, Alan S. Willsky and H. Nawab, Signals and Systems, Prentice Hall.

B.Tech (Electrical Engg.)
Semester-VII
ENERGY CONSERVATION AND MANAGEMENT

UNIT-I

Energy Review of various energy sources, Need of energy conservation and energy audit.

UNIT-II

Energy Conservation: Lighting energy: methods/Techniques of efficient lighting.Heating: methods/Techniques of energy Saving in Furnaces, Ovens and Boilers.Cooling: methods/Techniques of Energy Saving in Ventilating systems and Air Conditioners Motive power, Energy Efficient Motors, and Efficient use of energy in motors with the help of voltage reducers, automatic star/ delta converters . Power factor improvement devices and soft starters/Variable Frequency Drives. Amorphous Core Transformers Cogeneration -Typesand Advantages.

UNIT-III

Tariff and Energy Conservation in Industries: Energy cost and Recent MSEB tariffs, Application of Tariff System to reduce Energy bill, Energy Conservation by improving load factor and power factor**.**

Energy Conservation In Transmission and Distribution Systems: Reactive power compensation, demand side management, system voltage optimization and phase current balancing, Losses in transmission and distribution system and its minimization

UNIT-IV

Energy and the Environment: Environment and social concerns related to energy utilization, The green house effect, Global Warming and its effect , Pollution, Acid Rains, Global Energy and environment Management.

UNIT-V

Energy Audit: Procedure of Energy audit, ABC analysis, Energy Flow Diagram and its importance, Measurements in energy audit and various measuring instruments, Questionnaires for the energy audit, internal energy audit checklist, Equipment used for energy conservation, Calculation of payback period for energy conservation equipment. IE rules and regulations for energy audit, Electricity act 2003
(Numerical).

Reference Books:

1.C.L. Wadhawa Generation Distribution and Utilization of Electrical Energy New Age 2004.
2.Electrical Energy Utilization & Conservation. Dr. Tripathi S.Chand.

Text Books:

1. Energy Management – W.R. Murphy & G. Mckey Butler worths.
2. Energy Management Head Book- W.C. Turner, John Wiley.

B.Tech (Electrical Engg.)
Semester-VII
POWER SYSTEM ANALYSIS AND CONTROL

UNIT-I
Representation of Power System Components- Synchronous machines, Transformers, Transmission lines, one line diagram, Impedance and reactance diagram, per unit System.

UNIT-II
Symmetrical components- Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.
Symmetrical fault analysis- Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions.

UNIT-III
Unsymmetrical faults -Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance. Formation of Z bus using singular transformation and algorithm, computer method for short circuit calculations.

UNIT-IV
Load Flow- Introduction, bus classifications, nodal admittance matrix (Y BUS), development of load flow equations, load flow solution using Gauss Siedel and Newton Raphson method, approximation to N-R method, line flow equations and fast decoupled method.

UNIT-V
Power System Stability- Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by- step method. Factors affecting steady state and transient stability and methods of improvement.

Power Control- Concept of Load frequency control, Concept of voltage and reactive power control.

Reference Books:
1. W.D. Stevenson, Jr. "Elements of Power System Analysis", McGraw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
Text Books:
1.Kothari & Nagrath, "Modern Power System Analysis" Tata McGraw Hill.
2. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International.
List of Experiments:
1. To determine direct and sub transient axis reactance (x_d) and quadrature axis reactance (x_q) of a salient pole alternator.
2. To determine negative and zero sequence reactance of an alternator.
3. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation.
4. To study the IDMT over current relay and determine the time current characteristics.
5. To study percentage differential relay, Impedance, MHO and Reactance type distance relays.
6.To study Ferranti effect and voltage distribution in H.V. long transmission line using transmission line model.
7. To obtain formation of Y-bus and perform load flow analysis using Gauss-Siedel method.
8. To perform symmetrical and unsymmetrical fault analysis in a power system.

B.Tech (Electrical Engg.)
Semester-VII
UTILIZATION OF ELECTRICAL POWER

UNIT-I

Illumination- Nature of light, important definitions, laws of illumination, principle of production of light- discharge through gases under pressure – incandescence/sources of light-filament lamp, halogen lamp-discharge lamp-sodium discharge lamp,high pressure mercury discharge lamp, dual lamps, fluorescent lamps, lamp efficiency,requirements of good lighting, illumination level, absence of contrasts, shadows, glare, colour rendering-lamp fittings. Lighting schemes,design of indoor & outdoor lighting system-street lighting,flood lighting, photometers.

UNIT-II

Electric Heating- Advantages of electric heating, classification of heating methods, detailed study of resistance heating, arc heating, electron bombardment heating, induction heating & dielectric heating and their control.

UNIT-III

Electrolytic Processes- Fundamentals of electro deposition-laws of electrolysis applications of electrolysis, electro deposition, manufacture of chemicals, anodizing, electro- polishing, electro-cleaning, electro-parting, electrometallurgy, electric supply.

UNIT-IV

Train Mechanics- Types of services, characteristics of each type of service, speed time curve, simplified speed time curve, average speed, schedule speed, factors affecting schedule speed, tractive effort for propelling a train, power of the traction motor, specific energy output, specific energy consumption, factors affecting specific energy consumption, mechanics of train movement, coefficient of adhesion, factors affecting slip.

UNIT-V

Electric Traction- D.C. & A.C. traction motors, their characteristics Traction Motor Control: Starting and speed control of D.C. series motors, shunt transition, bridge transition, drum controller employing shunt transition, energy saving with series parallel starting, metadyne control, multiple unit control, braking of traction motor.Current Collection Systems- Conductor rail equipment, current collection gear for OHE: Cable collector, pole collector, bow collector, pantograph collector.

Reference Books:

1. H. Partap, “Art & Science of Utilization of Electrical Energy”.
2. N.V. Suryanarayana, “Utilization of Electric Power”.

Text Books:

1. BR Sharma, “Utilization of Electrical. Energy”.
2. P.V. Gupta, “A Course in Electrical Power”, Dhanpat Rai & Sons Delhi.

B.Tech (Electrical Engg.)
Semester-VII
MAJOR PROJECT (PLANNING AND LITERATURE SURVEY)

The object of Project Work I is to enable the student to take up investigative study in the broad field of Electrical Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the students in R&D work. The assignment to normally include: Survey and study of published literature on the assigned topic; Working out a preliminary Approach to the Problem relating to the assigned topic; Conducting preliminary Analysis/ Modelling/ Simulation/ Experiment/ Design/ Feasibility; Preparing a Written Report on the Study conducted for presentation to the Department; Final Seminar, as oral Presentation before a Departmental Committee.

B.Tech (Electrical Engg.)
Semester-VIII
COMPUTER AIDED MACHINE DESIGN

UNIT-I

Introduction to computer aided tools for analysis and design- software and hardware PSPICE /PSIM / MATLAB-SIMULINK/ MATHEMATICA/ 20SIM / LABVIEW / DSPACE (description as per choice/ availability)

UNIT-II

Modelling of Electrical/Electronic components and systems, Time and Frequency domain analysis, parameter variations, response representation storage/import/export**.**

UNIT-III

Optimization methods: parametric optimization and functional optimization. Design issues of Electrical/Electronic components and systems.

UNIT-IV

Applications for control systems, power systems and electrical machines**.**

Reference Books:

1.Paul W. Tuinenga, "SPICE : A guide to circuit Simulation and Analysis Using PSPICE", Prentice Hall.
2. M.H. Rashid, "SPICE for Circuits and Electronics Using PSPICE" Prentice Hall of India.

Text Books:

1. L.P.Singh, „Advanced Power System Analysis and Dynamics", New Age International.
2. M.Gopal, „Control Systems: Principles and Design", TMH.

B.Tech (Electrical Engg.)
Semester-VIII
POWER SYSTEM PLANNING AND RELIABILITY

UNIT-I

Review of Probability Theory Element of probability theory Probability Distribution, Random variable, Density and distribution functions. Mathematical expectation. Binominal distribution, Poisson distributions, Normal distribution, Exponential distribution, Weibull distribution**.**

UNIT-II

Reliability of Engineering Systems Component reliability, Hazard models, Reliability of systems with non-repairable components, series, Parallel ,Parallel-series configurations. Non-series-parallel configurations, minimal tie-set, minimal cut-set and decomposition methods. Repairable systems, MARKOV process, Long term reliability, Power System reliability.

UNIT-III

Reliability of Engineering Systems Reliability model of a generating unit, State space methods, Combing states, sequential addition method, Load modeling, Cumulative load model, merging of generation and load models, Loss of load probability, Percentage energy loss, Probability and frequency of failure, Operating reserve calculations.

UNIT-IV

Power Network Reliability Weather effect on transmission lines, Common mode failures, Switching after faults , state components, Normally open paths, Distribution system reliability.

UNIT-V

Composite System Reliability Bulk Power supply systems, Effect of varying load, Inter connected systems, correlated and uncorrelated load models, Cost and worth of reliability.

References:

1.J. Endreny, Reliability Modeling in Electric Power Systems, John Wiley & Sons.
2.Roy Billinton & Ronald, N allan, Reliability Evaluation of Power Systems, Plenum Press, New York.

B.Tech (Electrical Engg.)
Semester-VIII
MAJOR PROJECT

The object of Project Work is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the students in R&D work and technical leadership. The assignment to normally include: In depth study of the topic assigned in the light of the Report prepared ; Review and finalization of the Approach to the Problem relating to the assigned topic; Preparing an Action Plan for conducting the investigation, including team work; Detailed Analysis/ Modelling/ Simulation/ Design/ Problem Solving/ Experiment as needed; Final development of product/process, testing, results, conclusions and future directions; Preparing a paper for Conference presentation/Publication in Journals, if possible; Preparing a Dissertation in the standard format for being evaluated by the Department; Final Seminar Presentation before a Departmental Committee.

B.Tech (Electrical Engg.)
Semester-VIII
MODELLING AND 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 Book:

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

ELECTIVE SUBJECTS

B.Tech (Electrical Engg.)
Elective-1(A)
PLANNING FOR SUSTAINABLE DEVELOPMENT

UNIT-I

Introduction of Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability, strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.

UNIT-II

Innovation for sustainable development- Environmental management and innovation strategies.

UNIT-III

Societal transformations. Institutional theory.

UNIT-IV

Governance for sustainable development. policy responses to environmental degradation.

UNIT-V

Capacity development for innovation. research methods.

Text/Reference Books:

1.Harris, J.M. (2204) Basic Principles for Sustainable Development, Global Development and Environment Institute, working paper Available at:
http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF
2. Robinson, J. (2004) Squaring the circle? Some thoughts on the idea of sustainable development Ecological Economics.
3. Hjorth, P. and A. Bagheri (2006) Navigating towards Sustainable Development: A System Dynamics Approach, Futures.

B.Tech (Electrical Engg.)
Elective-1(B)
SCADA SYSTEM & APPLICATION

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.

B.Tech (Electrical Engg.)
Elective-1(C)
FACTS

UNIT-I

Introduction to FACTS controllers – Reactive power control: Reactive power,uncompensated transmission line, reactive power compensation ,principles of conventional reactive power compensators: Synchronous condensers, saturated reactor, phase angle regulator and other controllers.

UNIT II

Thyristor Controlled Shunt Compensator: Objective of shunt compensation- Principle and operating characteristics of Thyristor Controlled Reactor(TCR)-Thyristor Switched Capacitor(TSC)- Static VAR Compensators (SVC)- SVC control system- SVC voltage regulator model-Transfer function and dynamic performance of SVC- Transient stability enhancement and power oscillation damping, mitigation of sub-synchronous resonance.

UNIT III:

Thyristor Controlled Series Compensator (TCSC) : Series compensation – Principles of operation of TCSC- Capability characteristics of TCSC- Modeling of TCSC- TCSC control system- enhancement of system damping -mitigation
of sub-synchronous resonance.

UNIT IV

VSC Based Shunt and Series Compensator: Static Synchronous Compensator (STATCOM): Principle of operation, VI Characteristics, Harmonic performance – Steady state model – SSR mitigation. Static Synchronous Series Compensator (SSSC): Principle of operation and characteristics of SSSC – control range and VA rating – capability to provide real power compensation – Immunity to sub-synchronous resonance – control scheme for SSSC.

UNIT V:

Unified Power Flow Controller : Basic operating principles – conventional transmission control capability of UPFC – Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

Reference Books:

1. K. R. Padiyar, "HVDC Power Transmission Systems Technology and System Interactions", New Age International (p) Limited, New Delhi, 2003.
2. Gyugyi L, "Unified Power flow control concept for flexible AC transmission", IEEE Proceedings, vol. 139, no. 4, July 1992.

Text Books:

1. Narain G. Hingorani and Laszlo Gyugyi, "Understanding FACTS concepts and technology of flexible AC transmission systems" Edition 2001, IEEE power Engineering society Sponsor, IEEE press, 2001.
2. R. Mohan Mathur and Rajiv K. Varma, "Thyristor-Based FACTS Controllers for Electrical Transmission Systems", Edition February 2002, IEEE press-John Wiley and Sons publications, 2002.

B.Tech (Electrical Engg.)
Elective-2(A)
HIGH VOLTAGE ENGINEERING

UNIT-I

Conduction & Breakdown in Gases, Liquid & Solid Dielectrics: Gases -Ionization process, town send‟s current growth equation. Ist & 2nd ionisation coefficients. Townsend criterion for breakdown. Streamer theory of breakdown. Paschen‟s law of gases. Gases used in practice.

UNIT-II

Liquid Dielectrics-Conduction & breakdown in pure & commercial liquids, suspended particle theory, stressed oil volume theory, liquid dielectrics used in practice; Solid Dielectrics-Intrinsic, electromechanical, & thermal breakdown, composite dielectric, solid dielectrics used in practice; Applications of Insulating Materials: Application of insulating materials in power transformers, rotating machines, circuit breakers, cables & power capacitors.

UNIT-III

Generation of High Voltages & Currents: Generation of high D.C., A.C., impulse voltage & impulse currents. Tripping & control of impulse generators; Measurement of High Voltages & Currents: Measurement of high D.C., A.C. (Power frequency & high frequency) voltages, various types of potential dividers, generating voltmeter, peak reading A.C. voltmeter, Digital peak voltmeter, electrostatic voltmeter. Sphere gap method, factors influencing the spark voltage of sphere gaps.

UNIT-IV

High Voltage Testing of Electrical Apparatus: Testing of insulators, bushings, circuit breakers power capaitors & power transformers.

UNIT-V

Over voltage Phenomenon & Insulation Co-ordination: Theory of physics of lightning flashes & strokes. Insulation co-ordination, volt-time and circuit time characteristics. Boys camera, standard voltage & current shapes produced in Lab., Horn gap, single diverters, ground wires, surge absorbers.

Reference books:

1. M. S. Naidu and V. Kamaraju, “High Voltage Engineering, Tata Mc-Graw Hill.
2. M. P. Chaurasia , “High Voltage Engineering”, Khanna Publishers

Text books:

1. R. S. Jha, “High Voltage Engineering”, Dhanpat Rai & sons
2. C. L. Wadhwa, “High Voltage Engineering”, Wiley Eastern Ltd.

B.Tech (Electrical Engg.)
Elective-2(B)
GENERALISED THEORY OF MACHINES

UNIT-I

Review: Primitive machine, voltage and torque equation. Concept of transformation, change of variables, m/c variables and transform variables. Application to D.C. machine for steady state and transient analysis, equation of cross field commutator machine.

UNIT-II

Induction Machine: Voltage, torque equation for steady state operation, Equivalent circuit, Dynamic performance during sudden changes in load torque and three phase fault at the machine terminals. Voltage & torque equation for steady state operation of 1-ö induction motor & scharge motor.

UNIT-III

Synchronous Machine: Transformation equations for rotating three phase windings, Voltage and power equation for salient and non salient alternator, their phasor diagrams, Simplified equations of a synchronous machine with two damper coils.

UNIT-IV

Operational Impedances and Time Constants of Synchronous Machines : Park's equations in operational form, operational impedances and G(P) for a synchronous machine with four Rotor Windings, Standard synchronous machine Reactances, time constants, Derived synchronous machine time constants, parameters from short circuit characteristics.

UNIT-V

Approximate Methods for Generator & System Analysis: The problem of power system analysis, Equivalent circuit & vector diagrams for approximate calculations, Analysis of line to line short circuit, Application of approximate method to power system analysis.

Reference Books:

1. The General theory of Electrical Machines - B.Adkins
2. The General theory of AC Machines - B.Adkins & R.G.Harley
3. Generalised theory of Electrical m/c - P.S.Bhimbra

B.Tech (Electrical Engg.)
Elective-3(A)
EHVAC & DC 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 books:

1. S. Rao,- "EHV AC & DC Transmission" Khanna pub.
2. Kimbark,-" HVDC Transmission" jodhn willy & sons pub.

Text books:

1 Padiyar, -"HVDC Transmission" 1 t Edition ,New age international pub
2.Narain.G. Hingorani, l. Gyugyi-"Undustanding of FACTS concept and technology", John Wiley & sons
3. P.Kundur- "H.V.D.C. Transmission" McGraw Hill Pub.

B.Tech (Electrical Engg.)
Elective-3(B)
ADVANCE CONTROL SYSTEM

UNIT-I

State Space Analysis of Continuous System: Review of state variable representation of continuous system, conversion of state variable models to transfer function and vice-versa, solution of state equations and state transition matrix, controllability and observability, design of state observer and controller

UNIT-II

Analysis of Discrete System: Discrete system and discrete time signals, state variable model and transfer function model of discrete system, conversion of state variable model to transfer function model and vice-versa, modelling of sample hold circuit, solution of state difference equations, steady state accuracy, stability on the z-plane and Jury stability criterion, bilinear transformation

UNIT-III

Stability: Lyapunov‟s stability theorems for continuous and discrete systems, methods for generating Lyapunov function for continuous and discrete system, Popov‟s criterion.

UNIT-IV

Non linear Systems: Types of non linearities, phenomena related to non -linear systems. Analysis of non linear systems-Linearization method, second order non-linear system on the phase plane, types of phase portraits, singular points, system analysis by phase- plane method, describing function and its application to system analysis.

UNIT-V

Optimal Control: Introduction, formation of optimal control problem, Adaptive Control: Introduction, modal reference adaptive control systems, controller structure, self tuning regulators.Introduction to neural network, fuzzy logic and genetic algorithms

Reference Books:

1. B.C. Kuo, “Digital Control Systems” Sounders College Publishing

Text books:

1. Ajit K.Madal, “Introduction to Control Engineering: Modeling, Analysis and Design” New Age International.
2. D.Landau, “Adaptive Control”, Marcel Dekker Inc.
3. S.Rajasekaran & G.A.Vjayalakshmi Pai, “Neural Networks,Fuzzy Logic and Genetic Alogorithms: Synthesis and Applications” Prentice Hall of India

B.Tech (Electrical Engg.)
Elective-4(A)
ADVANCE POWER ELECTRONICS

UNIT-I

D.C. to D.C. Converter: Classification of choppers. Principle of operation, steady state analysis of class A chopper, step up chopper, switching mode regulators: Buck, Boost, Buck-Boost, Cuk regulators. Current commutated and voltage commutated chopper.

UNIT-II

A.C. to A.C. Converter: Classification, principle of operation of step up and step down cycloconverter. Single phase to single phase cycloconverter with resistive and inductive load. Three phase to single phase cyclo converter: Half wave and full wave. Cosine wave crossing technique. Three phase to three phase cyclo converter. Output voltage equation of cyclo converter.

UNIT-III

D.C. to A.C. Converter: Classification, basic series and improved series inverter, parallel inverter, single phase voltage source inverter, steady state analysis, Half bridge and full bridge inverter: Modified Mc Murray and Modified Mc Murray Bedford inverter, voltage control in single phase inverters, PWM inverter, reduction of harmonics, current source inverter, three phase bridge inverter.

UNIT-IV

Power Supplies: Switched mode D.C. and A.C. power supplies. Resonant D.C. and A.C. power supplies.

UNIT-V

Applications: Dielectric and induction heating. Block diagram of D.C. and A.C. motor speed control.

Reference Books:

1. Jacob, Michael Power Electronics: Principles & Application, Vikas Publishing House
2. M.H. Rashid, Power Electronics : Circuits, devices and applications , PHI.

Text books:

1. P.S. Bimbhra, „Power Electronics" , Khanna Publishers.
2. M.D. Singh and K.B. Khanchandani, Power Electronics, Tata McGraw-Hill.
3. A.K. Gupta & L.P. Singh, Engineering Risk–Benefit Analysis

B.Tech (Electrical Engg.)
Elective-4(B)
ENGINEERING RISK BENEFIT ANALYSIS

UNIT-I

Introduction- Knowledge and Ignorance, Information Uncertainty in Engineering Systems, Introduction and overview of class; definition of Engineering risk; overview of Engineering risk analysis. Risk Methods: Risk Terminology, Risk Assessment, Risk Management and Control, Risk Acceptance, Risk Communication, Identifying and structuring the Engineering risk problem; developing a deterministic or parametric model

UNIT-II

System Definition and Structure: System Definition Models, Hierarchical Definitions of Systems, System Complexity. Reliability Assessment: Analytical Reliability Assessment, Empirical Reliability Analysis Using Life Data, Reliability Analysis of Systems.

UNIT-III

Consequence Assessment-Types, Cause-Consequence Diagrams, Microeconomic Modelling, Value of Human Life, Flood Damages, Consequence Propagation. Engineering Economics: Time Value of Money, Interest Models, Equivalence.

UNIT-IV

Decision Analysis: Risk Aversion, Risk Homeostasis, Influence Diagrams and Decision Trees, Discounting Procedures, Decision Criteria, Tradeoff Analysis, Repair and Maintenance Issues, Maintainability Analysis, Repair Analysis, Warranty Analysis, Insurance Models.

UNIT-V

Data Needs for Risk Studies: Elicitation Methods of Expert Opinions, Guidance.

Reference Books:

1. Probability, Statistics, and Reliability for Engineers and Scientists, Ayyub & McCuen, 2003.
2. Probabilistic Risk Assessment and Management for Engineers and Scientists, by H. Kumamoto and E. J. Henley, Second Edition, IEEE Press, NY, 1996.

Text Books:

1. Risk Analysis in Engineering and Economics, B. M. Ayyub, Chapman-Hall/CRC Press, 2003.