NAGPUR UNIVERSITY

SCHEME OF TEACHING OF PART TIME B. E. ELECTRICAL(ELECTRONICS & POWER)

V SEMESTER PART TIME B. E.

Part Time B. E.Sub. Code	Regular B.E. Sub. Code	Name of Subject	Board	Teaching Scheme (Clock Hour / Week)				Assessment of Theory Marks				Assessment of Practical Marks				Duration of Question Paper
				L	T	P/D	Total	Paper	C.A	Total	Min. Pass	Pract.	C.A.	Total	Min. Pass	
5SPTEE01	6SEE01	Power Station Practice	EE	3	1	0	4	80	20	100	40	---	---	---	---	3 Hrs
5SPTEE02	6SEE03	Electrical Drives & Their Control	EE	4	1	0	5	80	20	100	40	---	---	---	---	3 Hrs.
5SPTEE03	6SEE04	Linear Electronics Circuits	EN	3	1	2	6	80	20	100	40	25	25	50	25	3 Hrs.
5SPTEE04	6SEE05	Control System - I	EE	4	1	2	7	80	20	100	40	25	25	50	25	3 Hrs.
		Total		14	4	4	22			400				100		

Credits Points = 14 + 2 + 2 = 18

TOTAL MARKS :- 400 + 100 = 500

NAGPUR UNIVERSITY

SCHEME OF TEACHING OF PART TIME B. E. ELECTRICAL(ELECTRONICS & POWER)

VI SEMESTER PART TIME B. E.

Part Time B. E.Sub. Code	Regular B.E. Sub. Code	Name of Subject	Board	Teaching Scheme Clock Hour / Week				Assessment of Theory Marks				Assessment of Practical Marks				Duration of Question Paper
				L	T	P/D	Total	Paper	C.A.	Total	Min. Pass	Pract.	C.A.	Total	Min. Pass	
6SPTEE01	7SEE01	Control System - II	EE	4	1	0	5	80	20	100	40					3 Hrs
6SPTEE02	7SEE02	Electrical Power - II	EE	4	1	0	5	80	20	100	40					3 Hrs
6SPTEE03	7SEE04	High Voltage Engineering	EE	3	1	2	6	80	20	100	40	25	25	50	25	3 Hrs.
6SPTEE04	7SEE05	Power Electronics	EE	3	1	2	6	80	20	100	40	25	25	50	25	3 Hrs.
		Total		14	4	4	22			400				100		

Credits Points = 14 + 2 + 2 = 18

TOTAL MARKS :- 400 + 100 = 500

HOD
Electrical Engineering
Tulsiramji Gaikwad-Patil College of Engineering and Technology

NAGPUR UNIVERSITY

SCHEME OF TEACHING OF PART TIME B. E. ELECTRICAL(ELECTRONICS & POWER)

VII SEMESTER PART TIME B. E.

Part Time B. E.Sub. Code	Regular B.E. Sub. Code	Name of Subject	Board	Teaching Scheme				Assessment of Theory Marks				Assessment of Practical Marks				Duration of Question Paper
				L	T	P	Total	Paper	C.A.	Total	Min. Pass	Pract.	C.A.	Total	Min. Pass	
7SPTEE01	6SEE02	Industrial Economics & Mgt.	ME	4	1	0	5	80	20	100	40	—	—	—	—	3 Hrs
7SPTEE02	7SEE03	Elective - I	EE	4	1	0	5	80	20	100	40	—	—	—	—	3 Hrs.
7SPTEE03	6SEE03	Switchgear & Protection	EE	4	1	2	7	80	20	100	40	25	25	50	25	3 Hrs.
7SPTEE04	6SEE06	Comp Aided Elect. Engg.Draw.	EE	1	0	2	3	—	—	—	—	25	25	50	25	
7SPTEE05	7SEE06	Project Seminar		0	0	3	3	—	—	—	—	—	50	50	25	
		Total		13	3	7	23			300				150		

Credits Points = 13 + 1.5 + 3.5 = 18

TOTAL MARKS :- 300 + 150 = 450

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NAGPUR UNIVERSITY

SCHEME OF TEACHING OF PART TIME B. E. ELECTRICAL(ELECTRONICS & POWER)

VIII SEMESTER PART TIME B. E.

Part Time B. E.Sub. Code	Regular B.E. Sub. Code	Name of Subject	Board	Teaching Scheme				Assessment of Theory Marks				Assessment of Practical Marks				Duration of Question Paper
				L	T	P/D	Total	Paper	C.A.	Total	Min. Pass	Pract.	C.A.	Total	Min. Pass	
8SPTEE01	8SEE01	Power Semi-Cond.Based Drives	EE	4	1	0	5	80	20	100	40	—	—	—	—	3 Hrs.
8SPTEE02	8SEE02	Elective - II	EE	4	1	0	5	80	20	100	40	—	—	—	—	3 Hrs.
8SPTEE03	8SEE04	Comp. Appl. in Electrical Engg.	EE	4	1	2	7	80	20	100	40	25	25	50	25	3 Hrs.
8SPTEE04	8SEE05	Project	EE	0	0	6	6	—	—	—	—	75	75	150	75	
		Total		12	3	8	23			300				200		

Credits Points = 12 + 1.5 + 4 = 17.5

TOTAL MARKS :- 300 + 200 = 500

Note :- Syllabus, Marking Scheme, List of Elective Subjects for regular B.E. and Part Time B.E. will be same.

HOD
Electrical Engineering
Tulsiramji Gaikwad-Patil College of Engineering and Technology, Nagpur.

B.E. SEMESTER III (ELECTRICAL ENGINEERIG).

3SEE01 SUBJECT:- APPLIED MATHEMATICS III

UNIT-1:- Laplace Transforms (09)

Laplace transform and their simple properties, simple applications for Laplace transforms to solve ordinary differential equations including simultaneous equations, solution of one-dimensional partial differential equations by transform method.

UNIT-2 :- Complex Variables (09)

Analytic function, Cauchy-Riemann conditions, conjugate functions, singularities, Cauchy's integral theorem & integral formula (statement only), Taylor's and Laurent's theorem (statement only) Residue theorem, contour integration.

UNIT-3:- Calculus of variations (06)

Maxima and Minima of functionals variation and its properties, Euler's equation, functionals dependent on first and second order derivatives, simple applications.

UNIT-4:- Fourier series and signal spectra (08)

Introduction, the Fourier theorem, Evaluation of Fourier coefficients, considerations of symmetry, (odd, even, rotational), exponential form; Fourier series, Fourier integral theorem, Fourier transform and continuous spectra.

UNIT-5:- Partial Differential Equation (08)

Partial differential Equation of first order first degree i.e. Langrage's form, Linear, homogeneous partial differential equation of n^{th}. order with constant coefficient method of separation ofr variables. Application to transmission lines

UNIT-6:- Matrices (08)

Inverse of matrix by adjoint method and its use in solving simultaneous equations, rank of matrix, consistency of system of equations , inverse of matrix by partitioning method. Linear dependence. Linear and orthogonal transformations, Characteristics equations, eigenvalues and eigenvectors. Reduction to diagonal form, Cayley Hamilton Theorem (without proof) statement and verifications, Sylvestors theorem, Association of matrices with linear differential equation of second order with constant coefficient. Determination of largest eigenvalue and eigenvector by iteration method.

REFERENCE BOOKS :-

1. Advance Engineering Mathematics :- Kreyszing
2. Higher Engineering mathematics :- B.S. Grewal

3SEE-02 # STEAM AND HYDROTURBINES

UNIT-1

A) **PROPERTIES & SYSTEM** :- Introduction, Properties of thermodynamics system such as specific volume, density, temperature, pressure etc. Their units and measurements. Laws of thermodynamics. Flow process and Non-Flow process.

B) **ANALYSIS OF SYSTEM** :- Conservation of energy and mass and their application to various thermodynamic systems such as steam plant, I..C. Plant, Refrigeration and all Air-conditioning plant.

UNIT-2 :- **IDEAL GASES AND VAPOURS**

Difference between gases and vapours, law of perfect gases, Heating and expansion of gases, Internal energy and specific heat of gases. Universal gas constant work done, changes in Internal energy, heat absorbed and rejected during various thermodynamic processes PV diagrams.

UNIT3:-- **PROPERTIES OF STEAM**

Critical state sensible heat, Latent heat and total heat of steam, internal energy of steam, dryness fraction, steam tables and their use. Entropy concept of entropy change for an ideal gas and steam. T and H charts, Carnot Rankine and Modified Rankine cycle, regenerative cycle.

UNIT-4:-

Steam Nozzles and turbines, flow of steam through convergent divergent nozzles.

UNIT-5:-

General study of steam and hydro Turbines, classification. Method of reducing rotor speed, Governing of turbines (No rigorous mathematical treatment is contemplated).

UNIT-6:- **CONDENSERS**

Different types of condensers. Their construction and principles of working.

REFERENCE BOOKS :-

1. Engineering Thermodynamics :- P.K. Nag
2. Thermal Engineering :- R.S. Khurmi

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3SEE-03 ELECTRICAL MEASUREMENT & MEASURING INSTRUMENT

UNIT-1:- **MEASURING INSTRUMENTS**

Classification as Analog & Digital instruments, comparison of Analog & Digital instruments, Advantages of digital instruments, Classification of Analog instruments. Absolute & secondary instruments. Indicating type instruments. Recording type instruments, Loading effect of instruments. Measurement of Resistance Classification, measurement by voltage drop method. Measurement of medium resistance Whetstone Bridge.:-
low resistance : Kelvin's Double Bridge
High resistance :- Ohmmeter, Megger & loss of charge method.
Earth resistance : earth tester.

UNIT-2:- **MEASUREMENT OF INDUCTANCE AND CAPACITANCE**

General theory of AC bridges, study of Maxwell, Hay's Owen:s De-Sauty Wein, Schering bridges, detectors for AC bridges.

UNIT-3:- **D. C. AND A.C POTENTIOMETERS**

Principles and use of D.C. potentiometer for calibration purposes, Principle and application of A C potentiometer.

UNIT-4:-
Ammeters, Voltmeters, Principle of moving coil, moving iron & Dynamometer type instruments, extension of range using series and shunts, errors due to extension of range . Digital voltmeter, Types of DVM, Ramp type DVM Integrating type DVM.

UNIT-5:- **MEASUREMENT OF POWER ENERGY**

Measurement of active and reactive power in polyphase circuits, using dynamometer type instrument Measurement of Energy in single and polyphase circuits using indication type instruments Errors in power and energy measurements maximum Demand Indicator Trivector meter.

UNIT-6:- **INSTRUMENT TRANSFORMERS**

General theory, extension of range using C.T. and P.T. , Errors in instrument Transformers, Applications of instrument transformers for metering & protection.

SPECIAL INSTRUMENTS :- Power factor meter, frequency meter, synchroscope, Rectifier type instrument, Digital frequency meter, Basic circuit (Block Diagram), Time base start & stop gate and complete simple circuit.

REFERENCE BOOKS :-

1. A course in Electrical & Electronics Measurement and Instrumentation :- A.K Sawhney
2. Electrical measurements :- Rajendra Prasad

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3SEE-04 **NETWORK ANALYSIS**

UNIT-1 Nodal and mesh basis equilibrium equations, matrix approach for complicated network, containing voltage, current sources and reactances, source transformations, quality.

UNIT-2 Network Theorems :- Superposition, Reciprocity, Thevenin's Norton's maximum power transfer, compensation, Tellengen's theorem as applied to A.C. circuits

UNIT-3 Trignometric and exponential Fourier series :- Discrete spectra and symmetry of waveforms, steady state response of a Network to non sinusoidal periodic inputs. Fouirier transforms and continuous spectra.

UNIT-4 Laplace transform and properties, partial fractions, singularity functions, waveforms, synthesis. Analysis of RC, RL and RLC network with and without initial conditions with Laplace transforms, evaluation of initial condition.

UNIT-5 Transient behaviour, concept of complex frequency, Driving points and transfer functions, poles, zeros of immittance function, their properties, sinusoidal response from Pole-zero location, convolution theorem and integral solution.

UNIT- 6 Two port Network parameters and inter-connections study of series and parallel resonance in A.C. Three phase unbalanced circuit and power calculations.

REFEENCE BOOKS :-

1. Network Analysis :- Van Valkenburg
2. Linear Network Theory :- Kelkar & Pandit
3. Circuits and Networks :- Sudhakar & S.P. Shyam Mohan.

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3SEE-05 ELECTRONIC DEVICE & CIRCUITS

UNIT-1:- SEMICONDUCTOR DIODES AND POWER SUPPLIED

Intrinsic and extrinsic semiconductors theory of PN junction, diode junction, capacitance,, Zener diodes, vector diodes, Tunnel diodes, Power supplies, Half wave & full wave Rectifiers/. Voltage doublers, filters, ripple factors. Zener and Emitter follower type series regulators.

UNIT-2 :- JUNCTION TRANSISTORS

Theory of operation, characteristics, break down voltage, current voltage power limitations. Biasing of BJT different biasing arrangement. Stability factor. Thermal runway, power transistors.

UNIT-3 :- BJT ANALYSIS

Small signal analysis of CE, CB, CC amplifiers and comparison. High frequency analysis, calculation of frequency response, gain bandwidth product.

UNIT-4 :- POWER AMPLIFIERS

Classification A,B,AB,C classes efficiency, push pull configuration (A,B,AB) complimentary symmetry, Distortions and cross over distortion.

UNIT-5:- POSITIVE AND NEGATIVE FEEDBACK AMPLIFIERS

Feed back amplifiers classification. Practical circuits applications, advantages, Stability, Oscillators, Barkhausen's criteria, RC, LC and Crystal Oscillators

UNIT-6 :- FET AND IT"S ANALYSIS

Field effect transistor and "MOSFET", Principle of operation and characteristic, biasing arrangement, small signal analysis of CG CS High frequency analysis.

REFERENCE BOOKS :-

1.Integrated Electronics, McGraw Hill :- Millman & Halkias
2. Electronics Device & Circuits :- Millman & Halkias

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B.E. SEMISTER IV (ELECTRICAL ENGINEERING)

4SEE01 ELECTRICAL ENGINEERING MATHEMATICS

UNIT-1 :- ROOT LOCUS TECHNIQUES

Mathematical modelling of physical systems and its differential equations (mechanical systems-basic translational and rotational elements, electrical systems. (Basic R-L-C series and parallel circuits), concept of transfer function, transfer function for elementary R-L-C circuits, elementary block diagram of single input single output, closed loop system and its reduction.

Laplace transform of step, ramp and parabolic signals. Time response of first order and general second order systems for unit step input. Concept of characteristic equation q(S)=0 c(t) vs. Time response.

Root locus concept, construction of root loci(scope limited to up to third order systems), time constant and pole zero form of generalised characteristic equation q(s)=1+G(s)H(s)=0, construction rules (derivations may be excluded). Determination of roots for specified open loop gain, determination of open gain for a specified damping ratio.

UNIT-2 :- POLAR AND BODE PLOTS

Concept of sinusoidal transfer functions, Polar plats (scope limited up to third order systems) Bode Plots-basic concepts, general procedure for constructing Bode plots, concept of octave and decade, determination of gain and phase crossover frequency and corresponding phase angles and log magnitude. Determination of transfer function from asymptotic Bode Plots.

UNIT-3 :- Z-TRANSFORM

Definition and properties, inversion z-trsanforms, z-transforms pairs, correlation with Laplace transform, Laplace transform and z-transformation pairs, z-transfer functions for linear discrete systems, linear difference equations, inverse z-transform and response of linear discrete systems (power series method Partial fraction expansion method.)

UNIT-4 :- FUZZY SETS AND NEURAL NETWORKS

Fuzzy sets and systems, crisp sets, overview of fuzzy logic and classical logic, fuzzy compliment, fuzzy union, fuzzy intersection and combinations of these fuzzy sets operations crisp and fuzzy relations.

Introduction to neural network algorithms, back propagation and delta rule, Hebbian learning

UNIT-5:- NUMERICAL METHOD FOR ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Solutions of linear and nor-linear algebraic and transcendental equations, method of false position, Newton-Raphson method, system of linear equations, Gauss elimination method, Gauss-Seidal method, Crout's method

UNIT-6 :- **NUMERICAL METHODS FOR DIFFERENIAL EQUATIONS**

Numerical solution of ordinary differential equations by Taylor's series method, Runge Kutta method, Modified Euler method, predictor corrector method, solution of simultaneous differential equations.

REFERENCE BOOKS :-

1. Control system Engineering :- I.J. Nagrath & M. Gopal
2. Numerical Methods :- S.S. Sastri
3. Fuzzy Engineering :- Bari Kosko

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4SEE-02 ELEMENTS OF ELECTROMAGNETICS

UNIT-1
Idea of vector & Scalars, Vector Algebra, Vector addition, Vector subtraction Dot product, scalar product in Cartesian co-ordinates system, conversion of variables from Cartesian to cylindrical system and viceversa. Spherical coordinate system,, transformation of Cartesian to spherical and vice versa

UNIT-2 Coulombs law, Electrical field intensity and electric flux density Coulomb's law, electric field intensity, field of n point charges, field due to continuous volume charge distribution, field of line charge, filed of sheet charge concept of flux density

UNIT-3 Gauss's law, Energy and potential of charge system,: Gauss's law, Application of Guass law, divergence theorem, definition of potential difference and potential, potential of a point charges, potential field of system of charge, potential gradient, Energy density in Electrostatic field.

UNIT-4 Conductors, Dielectric and Capacitance and Poisson's and Laplace's Equations. Current and current density, continuity of current, metallic conductors, conductor properties and Boundary conditions, Nature of Dielectric materials capacitance and capacitance's, Capacitance of parallel plate capacitor, Capacitance of two wire line, Poisson's and Laplace's Equations.

UNIT-5 The Steady Magnetic field and Magnetic forces:- Biot Savart's law, Ampere Circuital law, Stoke's theorem, Magnetic flux density, scalar and vector magnetic potential, force on moving charge, force between differential current elements. Nature of magnetically material. Magnetisation and permeability, magnetic circuits, potential energy and forces on magnetic materials, inductance and mutual inductance

UNIT-6 Maxwell's equation & boundary conditions. Elementary idea of Electromagnetic wave, uniform plane wave.

REFERENCE

1. Engineering Electromagnetic, 3rd Edition :- W.H. Hayt

4SEE-03 DIGITAL CIRCUITS

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UNIT-1 Analog Vs. Digital systems, transistor as a switch. Boolean algebra, Boolean identities , logic problems, Binary, Hex, Grey, Octal and ASCII codes, gates and their truth table D'Morgan's law., Sum of product and product of Sums.

UNIT-2 Combinational basic concepts, SSI MSI AND VLSI circuits, classification, standard TTL, CMOS characteristics, Decoders, Encoders, Multiplexers, Demultiplexers code converters, characteristics of display device's, standard configuration of gate as SSI/ MSI/ LSI circuits, Arithmetic Circuits adder's, subtactors (half and full) BCD adder/substactor, concept of ALU.

UNIT-3 Karanaugh Map, simplification of sum of products and products of sum, solution to problems using MUX as a function generator, simplification of logical functions using Quine-Mclausky method.

UNIT-4 Introduction to flip-flop, latches, concept of clock, Memories, organisation with flip-flop as basic cell, RAM, ROM, EPROM and EEPROM an overview. Master slave combination and conversion of one type to another type flip-flop. Multivibrators and their design parameters.

UNIT-5 Execution tables and introduction to sequential circuits, counters, synchronous/ asynchronous., Different module counters with reset/ clear facility, Design of counters of arbitrary module with K-maps, Lock free counters.

UNIT-6 Introduction to sequential system, Design of sequential system, using Moore and Miley system, fundamental mode sequential circuits.

REFERENCE BOOKS :-

1. Digital Logic Design :- R. P. Jain
2. Digital Integrated Electronics :- Herbart

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SEE-04 ELECTRICAL MACHINE-I

UNIT-1 3PHASE TRANSFORMER
Transformer operation and principle, O.C. & S.C. test on three phase transformer, determination of equivalent circuit.
Parameters, Regulation, Efficiency, Magnetising current and harmonics. Polarity test., various connections with vector groups.

UNIT-2 Three phase to two phase conversion, parallel operation of three phase transformer, method of cooling, temperature rise test, maintenance of transformer, insulation of transformer.

UNIT-3 D.C. MACHINE
Basic principle & operation, Armature reaction & commutation, Compensating winding, interpoles, Types of excitation. Characteristics of shunt, series & compound motor and generator, speed control of d.c. shunt & series motor constant horse power & constant torque drive of d.c. motor

UNIT-4 THREE PHASE INDUCTION MOTOR
Types of induction motor, production of torque, Torque-slip characteristics, No load & blocked rotor test. Equivalent circuit & determination of equivalent circuit parameters. Circle diagram, losses & efficiency. Double cage motor, operating characteristics & influence of machine parameter on the performance of motor.

UNIT-5 Starting of 3 phase I.M., speed control of I.M. by pole changing, frequency control, rotor resistance by varying supply voltage, braking, regenerative braking, plugging, dynamic braking, crawling & cogging.

UNIT-6 SINGLE PHASE I.M.

Double field revolving and cross field theory. Split phase motor, shaded pole motor, equivalent circuit, Torque-slip characteristics.

REFERENCE BOOKS :-

1. Electrical Machine :- P.K. Mukherjee & S. Charaborty
2. Electrical Machine :- Dr. P.S. Bhimbhra
3. Electrical Machine :- I.S. Nagrath & D.P. Kothari

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4SEE-05 COMPUTER PROGRAMING

UNIT-1 Information to computers and operating systems. Working with DOS, WINDOWS and Networking.

UNIT-2 Structure of "C" program, Data types, Storage class, variables, expressions and Operators.

UNIT-3 Program control statements, Concept of Function and Recursion, I/O through printf , scanf, file I/O, Open, Close, Read & Write.

UNIT-4 Arrays, Searching (Linear and Binary). Sorting (Bubble, Selection Sorts) File Handling.

UNIT-5 Pointers and structures, Singly linked list Insertion, deletion and updation.

UNIT-6 Introduction to 'C' concepts.

REFERENCE BOOKS :-

1. Let us "c" :- Y.P. Kanetkar
2. Pascal & C Programming :- Venugopal
3. Computer Programming in C :- Balguru Swami

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B. E. FIFTH SEMESTER (ELECTRICAL ENGINEERING)

5SEE01 ELECTRICAL POWER SYSTEM - 1

UNIT-1 **:**

Structure of electrical power system , brief exposure to generation , transmission & distribution aspects, elementary consideration of economic bulk power supply system, use of high voltage, general system consideration , idea about sub-station , concept of real , reactive & complex power , load & their

Characteristics, voltage & frequency dependence of loads .

UNIT –2 **:**

Representation of power system elements , models & parameters of generator , transformer & transmission lines , per unit system representation .

UNIT – 3 **:**

Elementary distribution schemes , feeders & distributors , L.T & H.T cables.

UNIT – 4 :

Voltage regulation & efficiency of power transmission lines using simple series equivalent representation . T- representation & and by circle diagram using generalized constant.

UNIT – 5 :

Inter connection of system elements to form two bus system , illustration of active & reactive power transmission , introduction to load flow studies in multi-bus system , introduction of frequency & voltage as system state indicator .

UNIT – 6 :

Elementary concept of real and reactive power control steady state performance of turbine governess . Load sharing between generators , preliminary concepts of automatic string efficiency , types of Insulators

Reference Books :-

1. Modern Power system analysis :-I.J.Nagrath& D.P.Kothari .
2. Electrical Energy System Theory :- Ole Elgerd.
3. Elements of Power system analysis :- W. D. Stevenson.
4. Power system analysis :-C.L Wadhwa .
5. Westinghouse Transmission & Distribution Handbook

5SEE02 INSTRUMENTATION

UNIT1:

Generalised instrumentation systems: Active and passive transducer, digital and analog mode of operation. Static and dynamic characteristics and performances of instruments. Statistical treatment of measurement errors . Gaussian error distribution, probability tables, combination of errors

UNIT2:Motion measuremen t: Relative and absolute motion measurement ,measurement of velocity and acceleration ,electrical transducers for motion measurement ,LVDT ,piezoelectric transducers, variable inductance transducers ,measurement of shaft torque and power.

UNIT3: Temperature measurement :- Laws of thermo-electric circuits . thermocouples ,cold junction compensation, thermistors. Radiation thermometry, broad band ,narrow band radiation methods, two colour pyrometers, optical pyrometers ,temperature compensation of sensors ,heat flux sensors.

UNIT4: Miscellaneous measurement :-Brief treatment of principles used in the measurement of liquid level, flow ,pressure and Ph. Cathode ray oscilloscope, introduction to data acquisition systems.

UNIT5:

Method of analog to digital conversion : Errors in A to D conversion, application in digital voltmeters, electronic frequency, time period measurement.

UNIT6:

Integrated circuits in instrumentation :- Operational amplifiers (741),comparators(339),timers(555),function generators(2206),constant current source using ICD .Elementary idea of microprocessors based instrumentation.

NOTE: Stress should be on electrical /electronic methods.

Reference Books :-

1. Measurement systems, application and design :- E.O.Doeblin (McGraw Hill).
2. Electronic instrumentation and measurement Technique. :- W.D. Cooper. (Prentice Hall)
3. Instrumentation for Engineering :-Dalley,Railey, Measurements. Mc Connel (John Wiley and Sons).
4. Electrical and electronic Measurement and Instrumentation. :- A.K. Sawhney
5. Instrumentation Devices and Systems :- Rangan (Tata McGraw Hill).

5SEE03: ELECTRICAL MACHINE DESIGN

UNIT1:

Review of material used in construction of electrical machines:

Classification of insulating materials depending upon permissible temperature rise ,properties of transformer oil ,standard specifications, C.M.R. and short time of machines . Heating and cooling characteristics.

UNIT2: Transformer design:

Specific loading, equation for voltage per turn for power and distribution transformer, output equation.

UNIT3:

Principle of electric and magnetic circuit design, method of cooling and cooling circuit design, estimation of performance characteristics from design data.

UNIT4. Induction motors:

Main dimension , output equation, loading constants, estimation of axial lengths, air gap diameter, winding design.

UNIT5:

Air gap length, slot combination for stator and rotor of I.M., cage rotor and wound rotor design. Calculation of no load current and other performance from characteristics for design data

UNIT6: Synchronous machines

Air gap length , methods of obtaining sinusoidal o/p voltage, field coil design for salient pole m/c and turbo generator rotor.

Ventilation of synchronous generator ,cooling air circuit, closed ventilation ,. Quantity of cooling medium hydrogen and water as cooling media.

1. Performance and Design of A.C. Machine :- M.G. Say. (C.B.S. Publisher, New Delhi)
2. Electrical Machine Design :-A.K. Sawhney, (Dhanpat Rai & Sons, Delhi)
3. Electrical Machine Design :- Balbir Singh (Brite Student Publication, Pune)
4. Power Transformers :- S.B. VasuBinsky. (P. S. G. College of Technology, Coimbtore)
5. Electrical Machine Design :-M.V. Deshpande.

5SEE04: MICROPROCESSORS AND INTERFACING

UNIT – 1:

VLSI circuit concept , approach to integrated system design using microprocessors , bus concepts, address , address data & control , organization of a computer with MPU , bits / bytes / words/ long words , there ranges, accuracy and precision , memory organization , linear/ absolute decoding .

UNIT – 2 :

Introduction to Intel 8085A architecture description , software instructions , address modes , advantages , timing diagram assess , assemblers & dissemblers .

UNIT – 3 :

Flag structure, concept of PSW , stacks & sub routines- simple and nested . PUSH , POP instructions and CALL / RETURN instructions. Stack manipulations and simple programs .

UNIT –4:

Interrupts – concept & structures in 8085 , interrupts service routines , advance instructions and programming of 8085A.

UNIT-5:

Methods of data transfer - serial , parallel ,synchronous , asynchronous .IN & OUT instructions , timing diagrams , simple hardware interface to 8085 of standard Latches / Buffers / Keys/ Display devices as IO PORTS . Handshaking concept . architecture and interface of 8255 & 8253 to 8085.

UNIT-6 :

Hardware considerations- bus contention , slow memory interfacing , complete signal description , multiplex keyboard / display interface & assemblers directives. General awareness about micro computer system related products.

Reference Books :-

1. Programming of 8085 :- D.V. Hall. (McGraw Hill)
2. Programming & Interfacing 8085A :- Ramesh Gaonkar. (Wiley Eastern).
3. Intel Microprocessors :- Goody (Tata McGraw Hill).
4. Microprocessors Principles and Applications :- Pal (Tata McGraw Hill).
5. Microprocessors Principles and Applications :- Gilmore (Tata McGraw Hill).

5S-EE-05 ELECTRICAL MACHINES-II

Unit-1:

Three phase synchronous generators : Introduction, Constructional features field of cylindrical and salient pole rotor machine, introduction to armature winding and field winding, MMF of armature and winding, induced EMF.

Unit-2:

Steady State Operation of three phase synchronous generators: Phasor diagram, regulation, steady state performance of three phase synchronous generators.

Unit-3:

synchronization of generator with another generator: parallel operation, experimental determination of parameters, short circuit ratio, losses and efficiency.

Unit-4:

Synchronizing machines on infinite bus: phasor diagram, expression for torque, load/torque angle, synchronous motor operation, effect of variable excitation and power input on generator operation and effect of variable excitation and load motor operation.

Unit-5:

Transient behavior: Sudden 3-phase short circuit, Transient and sub –transient reactance and their measurement, Time constant, and equivalent circuit diagram, damper winding.

Unit-6:

Introduction to special machine: Repulsion motor, AC series motor, universal motor, reluctance motor, hysteresis motor, schrage motor, power selsyns position selsyns (only elementary aspects of the above types are expected.

Reference Books :-

1. Electrical Machine :- Dr. P.K Mukherjee and S.Chakravarti.
2. Electrical Machinery :- Fitzegerald , Kingsley And Kusco. (McGraw Hill)
3. Electrical Machinery :-Nagrath and Kothari. (Tata McGraw Hill)
4. Electrical Machinery :- P.S. Bhimbra.

SIXTH SEMESTER B.E. ELCTRICAL

6S-EE-01 POWER STATION PRACTICE

Unit-1:

Sources of Electrical energy- oil and natural gas, water power, nuclear fission and fusion, their scopes and potentialities for energy conversion.

Generation- Different factors connected with a generating station, connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity and utilization factor, load curve, load duration curve, load survey, base load and peak load station, advantages of interconnection.

Unit-2:

Thermal Station- Choice of site, location, size and number of unit, general layout, major equipment, essential and non-essential auxiliaries, electric supply to auxiliary , cost of generation effect of different factors on costs.

Unit-3:

Hydro station:- Hydrology, stream flow, flow duration curve, power duration curve, mass curve reservoir capacity, type of hydro power plants and their field of use, pumped storage plant and their utility, surge tanks, governing characteristics of turbine and hydro generators.

Unit-4:

Nuclear Station- Principal of nuclear, energy, material, types of nuclear reactor, breeder reactor, location, material for moderator and control rods, cost economics.

Unit-5:

Voltage control of AC generators: Exciter instability, method of stabilizing exciter voltage, automatic voltage regulating action.

Tariff- different consideration of Flat rate and two part, economical choice.

Unit-6:

Non-conventional techniques of energy production:

(i)Solar energy-

Introduction, physical principal of conversion of solar radiation into heat, solar energy, collector, solar energy storage, solar electrical power generation and other miscellaneous applications of solar energy.

(ii) Wind energy-

Introduction, Basic principal of wind energy conversion, wind delta, energy estimation, site selection, basic component of wind energy conversion system, various application of wind energy.

(iii) Energy from Tides and Oceanic waves-

Introduction Basic principal of tidal power, site selection of storage and plant layout for tidal power plant – introduction to wave energy and site energy plant s wave energy based plant power plant layout, analysis of tidal and wave energy plants.

6S-EE-02 (SU-1, 5ET-1, 5IE-1, 5DT-1, 4PTU-1, 5IN-1)

Reference Books :

1. Electrical Power stations :- Car.
2. Electrical power system control :- H.P. Young.
3. Generating stations :- Lowels.
4. Elements of power stations design :- M.V. Deshpande.
5. Energy conversion and power Generation :- L.D.Agrawal and G.K. Mittal
6. Non-conventional energy sources :- G. D. Rai.

6S-EE-02 Engineering Economics & industrial Management

Unit-I:

Demand utility and Indifference curve, Approaches to analysis of demand, Elasticity, of demand, Measures of demand elasticity, Factor of production, advertising Elasticity, Marginalism.

Unit-II:

Laws of returns and costs, Price and output determination under perfect competition, oligopoly, depreciation and methods for its determination.

Unit-III:

Functions of central and commercial bank Inflation, Deflation, Stagflation, Direct and indirect taxes, Mona try and cycles, new economics policy, Liberalization, Globalisation, Privatisation, Marked friendly state. Fiscal policy of the Government, Meaning phases of business.

Unit-IV:

Definition, nature and scope of measurement, Functions of management planning , Organizing, Directing, Controlling, Communicating.

Unit-V:

Meaning of marketing managements, Concept of marketing , Marketing mix, Administrative and cost plus pricing, Channels of distribution, Advertising and sales Promotion.

Unit-VI:

Meaning, nature and scope of Financial management, Brief out line of profit and loss account, Balance Sheet, Budgets and their importance, Ratio analysis, Principals of costing.

Reference Books :

a. Modern Economics : H.L.Ahuja
b. Modern Economic theory : K.K.Dewett
c. Monetory economics : M.L.Seth
d. Industrial Management : I.K.Chopde, A.M.Sheikh
e. Business Organisation and : S.A. Sherlekar
f. Managerial Economics : Joel Dean
g. Managerial Economics : Pylee
h. Economics : Samuelson
i. Managerial Economics : Joel Dean

6S-EE-03 Electrical Drives & their Control

Unit-1:

Definition, Classification, and speed torque characteristics of common drive motors and their characteristics under starting , running braking and speed control.

Unit-2:

Selection of motors : Power capacity for continuous and intermittent periodic duties , Flywheel effect.

Unit-3:

PLC its programming and its applications in electrical drives.

Unit-4:

AC and DC contactor and relays :Lock out contactor, magnetic structure, operation, arc interruption, contactor rating, H. V. Contactor , control circuit for automatic starting and braking of DC motor and three phase induction motor , Control panel design for MCC.

Unit-5:

Traction motors: Motors use in AC/DC traction : Their performance and desirable characteristics, requirement and suitability of motor for traction duty , Traction motor control –control of DC traction motor . Series parallel control with numerical , Starting and braking of traction motor.

Unit-6:

Brief idea about drives commonly use in industries , Digital control of Electric motor, Block Diagram arrangement , comparison with other method of control.

Reference Books :-

1. Magnetic control of Industrial motors :- Heumann.
2. A course in electrical power :- Soni, Gupta, Bhatnagar.
3. Modern Electric Traction :- H. Pratap.
4. Art & Science of utilization of Electric traction :- H. Pratap

6S-EE-04 LINEAR ELECTRONIC CIRCUITS

Unit-1:

Basic Operational amplifier circuits: Differential amplifier stage, current sources. biasing level shifting techniques, common mode and difference mode and difference mode gains and impedance of a different stage.

Unit-2:

Overload protection circuits Frequency response and compensation, characteristics of ideal and non-ideal operational amplifier, Error measurement of various parameters.

Unit-3:

Simple linear circuit: Inverting, non-inverting , buffer amplifier, summer integrator , differentiator, log, antilog, Multiplier, instrumentation amplifier, grounding and shielding problem in instrumentation amplifier.

Unit-4:

Precision rectifier, RMS to DC conversion, constant current and voltage sources, Sinusoidal oscillator with frequency and amplitude stabilization elementary , idel of active filter with butter wroth second order filter design procedure.

Unit-5:

Applications of Operational amplifier for clipping, clamping, comparator circuit with non-linear components, Multiplexers, Demultiplexer, astable, mononstable, bistable, multivibrator, circuits using OA, sample/ hold circuits, D/A and A/D convertions circuits, Phased locked loops.

Unit-6:

Study of Linear ICS like LM741, LM555, LM556, LM565, LM339, and LM723.

1. Linear Integrated Circuits Manual Vo. I, II, III :- National Semiconductors.
2. Linear Application Handbook :- National Semiconductors.
3. Operational Amplifiers :- Dailey (Tata McGraw Hill).
4. Introduction to Operational Amp. :- Wait (Tata McGraw Hill).
5. Designing with Op. Amps. :- France (Tata McGraw Hill).

6SEE05 : CONTROL SYSTEM ENGINEERING-I

UNIT 1 :-

Introduction to need for automation and automatic control use of feedback broad spectrum of system application Mathematical modelling diff. Equations. Transfer functions block diagram, signal flow graphs, application to elementary systems simplifications, effect of feedback on parameter variations, disturbance signal servomechanism and regulators. Control system compotes, electrical electromechanical, their functional analysis and input output representation.

UNIT 2 :-

Time response of system First order and second order system standard inputs. Concept of gain and time constants Steady state error type of control system, approximate methods for higher order system.

UNIT 3 :-

Stability of control systems, conditions of stability, characteristics equation Routh Hurwitz criterion. Special cases for determining relative stability.

UNIT 4 :-

Roots location and its effect on time response elementary idea of route locus effect of addition of pole and zero on proximity of imaginary axis.

UNIT 5 :-

Frequency response method of analysing linear system Nyquist and Bode Plot, stability and accuracy analysis from frequency response, open loop and close loop frequency response. Nyquist criterion, Effect of variation of gain and addition of pole and zero on response plot, stability margin in frequency response.

UNIT 6 :-

State variable method of analysis characteristic of system static Choice of state representation of vector matrix differential equation, standard form, relation between transfer function and state variables.

1. Automatic control system :- B.C. Kuo. (P.H.I.)
2. Control system analysis :- Nagrath/Gopal
3. Linear system analysis :- D'azzoand Houpis (M.H.)
4. Control system, Principles and Design :- M. Gopal. (T. M. H.)

SEVENTH SEMESTER B. E. ELECTRICAL ENGINEERING

7SEE01 CONTROL SYSTEM -II

UNIT 1 :- Compensation :- Review of performance Analysis of type O, type 1 & type 2 systems. Need for compensation. Performance Analysis of Compensators in time & frequency domain, Bode Plots Design of Compensators is not required.

UNIT 2 :- Design by State variable Feed back : Review of state variable representations. Solution of state equation Controllability & observability. Design by SVF.

UNIT 3 :- Optimal control system :- Performance Index desirability of single P.I Integral square error. Parameter optimisation with & without constraint , optimal control problem with T..F approach for continuous time system only.

UNIT 4 :- Non Linear control system : Types of non-linearities, characteristics of NLCS . Inherent & intentional non-linearities. Describing function method for Analysis Describing functions of some common non-linearities. Stability analysis. Limit cycles & stability of limit cycles.

UNIT 5 :- Phase -Plane Method :- Singular points stability from nature of singular points Construction of trajectory by Isocline and Delta Method Computation of time

UNIT 6 :- Sample Data control System ;- Representation of SDCS, Sample and Hold Circuit Z-Transform, Inverse Z-Transform & solution of difference equation "Z" & "S" domain relationship. Stability by Bi-linear transformation & Jury's test. Discretization of continuous time state equation. Solution of Discrete time state equations. Controllability & observability of Discrete time systems.

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7SEE02 **ELECTRICAL POWER SYSTEM-II**

UNIT 1 :- Symmetrical component transformation. Three phase power in unbalanced circuit in terms of symmetrical component. Sequence impedances of Generator, Transformer, Transmission line & passive loads. Phase shift in Y/Delta three phase transformer (yd1, yd11 connection.)

UNIT 2 :- Symmetrical fault analysis without & with prefault load currents ,selection of circuits Breakers ratings, current limiting reactors.

UNIT 3 :- Unsymmetrical fault Analysis L-G, L-L-G,L-L, Open Conductors faults analysis using symmetrical components.

UNIT 4 :- Stability of power system - Steady state, Dynamic and Transient stability definition .Dynamics of synchronous machine, swing equation, swing equation for machines swinging coherently and Non-Coherently. Power angle equation, Steady state stability studies.

Transient stability studies :- Swing curve, Equal Area criterion for transient stability, Application of equal area criterion for different disturbances. Solutions of swing equation by point by point method. Methods of improving transient stability.

UNIT 5 :- Economic operation of power system : Introduction, Distribution of load between units within the plant. Optimum generation scheduling considering transmission losses. Representation of transmission loss using loss formula co-efficient. Derivation of loss formula co efficient, simulation of co-ordination equation on digital computer.

UNIT 6 :- 1) Grounding of Neutral in power system.

2) Shunt & series compensation :-

Generalised equation, shunt reactor compensation of very long line with intermediate switching station, series capacitor compensation at line centre. Shunt reactors at both ends and series capacitor in middle of line. Elementary idea of sub-synchronous resonance problem and counter measures.

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7S-EE-03(1) ELECTIVE – 1 NON CONVENTIONAL ENERGY SOURCES

UNIT I: - Solar radiation & its Measurement :- Solar constant, Solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surfaces.
UNIT II: - Solar Energy Collectors :- Physical principles of the conversion of solar radiation into heat, flat plate collectors, transmissivity of cover systems, energy balance equation and collector efficiency, concentrating collectors, comparison of concentrating and flat plate collectors, selective absorober coatings.
Solar energy storage systems (Thermal, Electrical, Chemical, Mechanical), Solar ponds.
UNIT III: - Applications of Solar Energy :- Solar water heating, space heating, space cooling, solar thermal heat conversion, photovoltaic solar energy conversion, solar pumping, solar cooking.
UNIT IV: - Wind Energy :- Basic principles of wind energy conversion, wind energy conversion, wind data and energy estimation, site selection considerations, basic components of wind energy conversion systems(WECS), classification of WEC systems, generating system, energy storage, application of wind energy.
UNIT V: - Energy from oceans :- Ocean thermal electric conversion (OTEC), Claud & Anderson cycles, evaporators, Bio-fouling, hybrid cycle.
Energy from tides :- Introduction, basic principles of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of energy & power in simple single basin tidal system, advantages and limitations of tidal power generations, energy & power from waves, wave energy conversion devices, small scale hydro electric power generation.
UNIT VI: - Other non-conventional energy sources (brief introduction to operating principles only) – Energy from bio-mass, geothermal energy, MHD power generation.

Text Book :-
Non Conventional Energy Sources :- G.D. Rai, Khanna Publishers.

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7 S-EE-03 [2] Elective 1-I.T. & its Application in Power System Control

UNIT# 1
Real-time issues on signal transmission and controls; Communication system for industrial automation; Data acquisition and Supervisory control; Control of discrete manufacturing processes; Intelligent system for monitoring, supervision and control; Case studies of industrial control systems.

UNIT#2
Energy Auditing –Introduction, importance of Energy Audit, basic terms of energy audit , procedure for carrying energy audit instruments used for energy audit such as power analyzer, multipoint heat flow meter lux meter portable infra red radiation thermometer, thermocouple based temperature indicator.
Energy Conservation & Management -Need & Importance of Energy Conservation & Management <payback period, return on investment [ROI], life cycle costs. Specific energy consumption. Calculation of Energy costs of specified products &simple systems Analysis of selected energy intensive units like iron –steel cement, petroleum refining etc.

UNIT#3
Principles of multi –objective Energy management- with emphasis on conservation, User-friendly software development on Windows 9x,UNIXPlatforms for Energy Conservation & Management Studies.

UNIT#4
Serial data communication using RS232 and RS485 based systems. Distributed measurement system,IEEE488 protocol

UNIT#5
Local area Networks-common topologies, Medium access control –round robin. reservation and contention –based strategies, ALOHA protocol and its variants CSMA and CSMA/Protocols, token ring protocol ,IEEE802 standards for local area networks, High speed LANs-Fast Gigabit Ethernet FDDI, Wireless LANs, Internetworking- Repeaters , bridges, routers and gateways ,TCP/IP protocol suite TCP/IP Sockets ,Client server computing, Name Service, Application protocols over TCP/IP, Network Security

UNIT#6
Design of microprocessor based Instrumentation systems, design of interfacing circuits and data acquisition system.

Books;

1. Microprocessor & Interfacing by D.V.Hall

2. LAN by Keiser.Mcgraw Hill
3. Energy Management by William Tsynder& Fredric W Symonds vol II
4. Energy Management Handbook by W.C.Turker

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7S-EE-03(3) ELECTIVE – 1 FUZZY LOGGY & NEURAL NETWORK

UNIT – I **Introduction:**
1. Fuzzy sets, Approximate reasoning Representing set of rules.
2. Fuzzy knowledge based (FKBC) parameters. Introduction rule and data base inference engine, choice of fuzzyfication and defuzzification processes.

UNIT – II: **Nonlinear fuzzy control**:
Introduction, Control problem, FKBC as nonlinear transfer element, types of FKBC.

UNIT – III : **Adaptive Fuzzy control:**
Introduction, design and performance evaluation, main approach to design.

UNIT – IV:
1. Fundamental concept of ANN.
2. Model of artificial Neuarl network (ANN), Learning & adaptation learning rules.

Feed forward networks:
Classification Model, features & decision, regions, Minimum distance classification, perceptron, delta learning rules for multiperceptron layer, Generalized learning rules, back propagation algorithm, back propogation training, learning factors.

UNIT – V: **Recurrent networks:**
Mathematical founadation of discrete time & gradient type hopefield networks, transient response & relaxation modeling.

UNIT – VI: **Associative memories & self organizing networks:**
Basic concept & performance analysis of recurrent associative memory, Bidirectional associative memory, Hamming net & MAXNET Unsupervised learning of clusters, counter propogation network, feature mapping, self organizing feature maps, cluster discovery network. (ART 1)

BOOKS:

1. Introduction of Artificial Neural Networks, Jacek Zurada (JPH)
2. Neural Network & Fuzzy Systems, Bart Kosko (PHI)
3. Neural Networks: Comprehensive Foudation, Simon Haykin (Maxwell) Macmillan Canada Inc.)
4. An Introduction to Fuzzy Control, D. Drianko, Norsa.
5. Fuzzy sets: Uncertainty & information, Klir & Folger (PHI)
6. Digital Image Processing (AWPC) By Gonzalez.

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7S-EE-03[4] Elective I FLEXIBLE AC TRANSMISSION SYSTEMS

Unit-1
FACTS Concept and General System Consideration Transmission Interconnections, Flow Of power in an AC

System factors affecting the Loading

Capability power flow and Dynamic Stability Consideration of Transmission Interconnection Importance of controllable Parameters FACTS Controller
Unit-2
Voltage-Sourced and Current-Sourced Converters Basic Concept of Voltage –Sourced Converter Single –Phase Full-Wave Bridge C0nverter Operation Single phase-Leg Operation Square Wave Voltage Harmonics for Single phase Bridge Three-phase Full-Wave Bridge Converter Sequence of Valve Conduction Process in Each Phase-

Leg Transformer connection for 12-Pluse Operation Three Level Voltage Sourced Convert pulse-Width Modulation, generalized technique for harmonic elimination and voltage control, basic concepts of CSI , Thyristor based converters , CSI with turn off devices, current source versus VSI.

Unit -3
Static shunt compensators: SVC and STATCOM Objectives of shunt Compensation Methods of Controllable Var Generation Static var Compensators SVC and STATCOM Comparison between STATCOM And SVC Static Var System
Unit-4;
Static Series Compensators; GCSC .TSSC .TCSC and SSSC Objectives of series Compensation Variable Impedance Type Series compensators Switching Converter Type Series Compensators External [System]Control for Series Reactive Compensators Unit-5 Static Voltage and Phase Angle Regulators; TCVR and TCPAR; Objectives of Voltage and PHASE Angle regulators Approaches to Thyristor Controlled Voltage and Phase Angle Regulators [TCVR] and TCPARS] Switching Converter-Based Voltage and Phase Angle regulators Hybrid Phase Angle Regulators
Unit-6
Combine Compensators [UPFC. IPFC] and Special Purpose FACTS Controllers The Unified Power Flow Controller [UPFC] Interline Power Flow Controllers Generalized and Multifunctional FCTS Controllers Sub-synchronous Resonance NGH-SSR Damping Scheme Thyristor-Controlled Braking Resistor [TCBR]
Books

Understanding FACTS by Naryan G Hingorani and Laszlo Gyigyi [Standard Publishers]

Reference;

1. Flexible AC Transmission System [FACTS] Edited by Yong Hua Song and johns [IEEE]Publishers]

7S-EE-03(5) ELECTIVE – 1 FUZZY LOGGY & NEURAL NETWORK

UNIT – I **Introduction:**
1. Fuzzy sets, Approximate reasoning Representing set of rules.
2. Fuzzy knowledge based (FKBC) parameters. Introduction rule and data base inference engine, choice of fuzzyfication and defuzzification processes.

UNIT – II: **Nonlinear fuzzy control**:
Introduction, Control problem, FKBC as nonlinear transfer element, types of FKBC.

UNIT – III : **Adaptive Fuzzy control:**
Introduction, design and performance evaluation, main approach to design.

UNIT – IV:
1. Fundamental concept of ANN.
2. Model of artificial Neuarl network (ANN), Learning & adaptation learning rules.

Feed forward networks:
Classification Model, features & decision, regions, Minimum distance classification, perceptron, delta learning rules for multiperceptron layer, Generalized learning rules, back propagation algorithm, back propogation training, learning factors.

UNIT – V: **Recurrent networks:**
Mathematical founadation of discrete time & gradient type hopefield networks, transient response & relaxation modeling.

UNIT – VI: **Associative memories & self organizing networks:**
Basic concept & performance analysis of recurrent associative memory, Bidirectional associative memory, Hamming net & MAXNET Unsupervised learning of clusters, counter propogation network, feature mapping, self organizing feature maps, cluster discovery network. (ART 1)

BOOKS:

1. Introduction of Artificial Neural Networks, Jacek Zurada (JPH)
2. Neural Network & Fuzzy Systems, Bart Kosko (PHI)
3. Neural Networks: Comprehensive Foudation, Simon Haykin (Maxwell) Macmillan Canada Inc.)

4. An Introduction to Fuzzy Control, D. Drianko, Norsa.
5. Fuzzy sets: Uncertainty & information, Klir & Folger (PHI)
6. Digital Image Processing (AWPC) By Gonzalez.

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7SEE04 **HIGH VOLTAGE ENGINEERING**

UNIT 1 :- Breakdown mechanism in Dielectrics : Ionisation process : Townsend's criterion for B.D, Break-down . In electro-negative gases, Time -lag for B. D., Streamer theory for B.D. in gases, Paschen's law, B.D. in non-uniform fields, corona discharges and Introduction of corona Post B.D. phenomenon and applications, practical considerations in suing gases for insulation purposes vacuum insulation, liquid as insulators, conduction and B.D. in Pure and commercial liquids. Intrinsic electromechanical and thermal B.D. ,B.D. of solid dielectric in practice, B.D. in composite dielectric.

UNIT 2 :- Lighting and switching over voltages :- Mechanism of lighting types of strokes, parameter and characteristics of lighting strokes, characteristics of switching surges; power frequency over voltages, control of O.V. due to switching . Protection of lines by ground wire , protection by lightning Arrester, gap type and gapless L.A. selection of L.A. ratings, surges absorbers.

UNIT 3 :- Travelling waves and insulation co-ordination: Travelling waves on transmission lines, classifications of lines, attenuation and distortion of travelling wave, reflection and transmission of waves, behaviour of rectangular waves at transition points. Introduction to insulation co-ordination associated terms, impulse wave-form, introduction to BIL ,Reduced BIL and SIL.

UNIT 4 :- Generation of high voltage and currents : Generation of High D.C. voltages by rectifiers ,voltage doubler and multiplier circuits (Derivations of expression not required) electrostatic machines. Generation of high AC voltage by Cascade transformers, Resonant transformers. Generation of high impulse voltages : Standard impulse wave shapes , analyses of model and commercial impulse generation circuits, waveshape control, Marx Circuit , tripping and control of impulse generation, generation of switching surges, generation of impulse current.

UNIT 5 :- Measurement of high voltage and current :- Measurement of high AC and DC voltages by micro ammeter, generating voltmeters, resistance and capacitance potential devices, series impedance voltmeter, CVT , Magnetic type potential transformers, electrostatic voltmeter ,peak reading AC voltmeters , sphere gap arrangement Measurement of impulse voltage by potential devices and peak reading voltmeters. Measurement of High AC/DC currents : Measurement of high frequency and impulse current by resistive shunts (Bifiliar strip shunt only).

UNIT 6 :- Non destructive and high voltage testing of electrical apparatus : Non destructive testing : Measurement of DC Resistivity, measurement of dielectric constant and loss-factor (low and power frequency only) ,Schering bridge for high charging circuits, for high dissipation factor , for three terminal measurements, transformer ratio arm bridges, partial discharge measurements by straight detector by balance detectors, calibration of detectors, discharge detection in power cables. High voltage testing : Testing of insulators, bushings, isolators, circuit breakers, cables, transformers lightning arresters and power capacitors.

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7SEE05 **POWER ELECTRONICS**

UNIT 1 :- SCR and its characteristics gate characteristics, SCR turn off, ratings, series and parallel connections of SCRs . Triac and its applications. Unijunction transistors, Triggering circuits and optocouplers.

UNIT 2 :- Line commutated converters : Working of single pulse convertors, two pulse midpoint converter three pulse midpoint converter and 3 phase six pulse bridge converter, effect of source inductance in converters, effect of free wheeling diode.

UNIT 3 :- Single phase and three phase half controlled convertors, speed control of d.c. motors using line commutated converters. Cycloconverters (single phase).

UNIT 4 :- Static controllable switches :- characteristic and working of MOSFET, Gate turn off thyristor and insulated gate bipolar transistor, protection of SCR gate circuit protection, over voltage and over current protection, snubber circuit design, converter circuit faults and their protection.

UNIT 5 :- D.C. Choppers : Principles of step down chopper, step up chopper classification, Impulse commutated and resonant pulse choppers. Multiphase choppers. Application of choppers.
Inverters : Basic series resonant inverter, half bridge and full bridge series resonant inverters.

UNIT 6 :- Single phase and three phase bridge invertors, commutation and trigger circuits for forced commutated thyristor inverters, Output voltage control, Harmonics in output voltage waveforms . Harmonic attenuation by filters, Harmonic reduction by pulse width modulation techniques. Analysis for single pulse width modulation working of current source inverters, few applications of inverters.

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EIGHTH SEMESTER ELECTRICAL ENGINEERING

8SEE01 POWER SEMICONDUCTOR BASED DRIVES

UNIT 1 :- Dynamics of electric drives and control of electric drives, energy conservation in electric drives.

UNIT 2 :- D.C. motor drives :- Controlled rectifier fed d.c. drives, single phase & three phase rectifier control of d.c. separately excited motor Rectifier control of d.c. series motor, Dual converter control of d.c. separately excited motor. Power factor, supply harmonics and ripple in motor current. Chopper controlled dc drives of separately excited dc motor. Chopper control of series motor, source current harmonics.

UNIT 3 :- Induction motor drives :- Stator voltage control, variable frequency control using voltage source invertor, current sources invertor and cynloconverter.

UNIT 4 :- Synchronous motor drive : Starting , Braking of synchronous motor, Variable frequency control, self controller synchronous motor drive employing load commutated thyrister inverter of cycloconverter , starting of large synchronous motors.

UNIT 5 :- Brushless dc motor , stepper motor, switched reluctance motor drives and eddy current drives . Introduction to solar and battery powered drives .

UNIT 6 :- Traction drives :- Conventional dc and ac traction drives, semiconductors converter controlled drives, 25 KV AC traction using semiconductor converters controlled dc motor. DC traction using semiconductor, chopper controlled dc motors,. Polyphase AC motors for traction drives.

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8SEE02(1) EHV AC & HVDC TRANMSMISSION

UNIT 1: 1) Power handling capacities of EHV AC transmission lines.

2) Voltages gradients : Electric field of point charge, sphere gap line-charge. Single and three phase lines, and bundled conductors. Maxwell's potentials coefficients, Mangoldt Formula.

UNIT 2 :-
1) Electrostatic and electromagnetic fields of EHV lines, electric shock and Threshold current : capacitance of an object : calculation of electrostatic field of A.C. lines (3 phase single and double circuit lines only). Effect of

high electrostatic field, measurement of electrostatic field, induced voltages in insulated ground wires , electromagnetic interference.
2) Corona : Types, critical disruptive voltages : Factors affecting corona, Methods for reducing corona power loss, corona current wave form, charge voltage diagram, audible noise and radio interference.

UNIT 3 :- I) Comparison for EHV AC and HVDC systems.

ii) Conversion from AC to DC , Rectifiers, converters conversion from DC to AC, Inverters.

iii) Kind of DC link.

iv) Earth electrode and earth returns.: - Introduction, objectives, location and configuration, resistance of electrodes, means of reducing earth electrode resistance, troubles caused by earth current and remedies.

v) Multiterminal HVDC system :- Introduction , 2 pole transmission, MTDC system with series and parallels connected converters, advantages and parallel connected converters, advantages and applications, configurations and types.

UNIT 4 :- i) Power flow control in HVDC system :- Constant current. Constant voltage, constant ignition and excitation angle control, control characteristics.

ii) Parallel operation of AC and DC links (Synchronous and Asynchronous links.) .

UNIT 5 :- i) Harmonic Filters :- Introduction, Filters, surge capacitors and damping

circuits, shunt filters, series filters, AC filters, design of AC filters and tuned filters, double frequency and damped filters, cost considerations, Ratings harmonics on D.C is side of converters. DC Harmonics filters.

ii) Reactive power compensation :- Reactive power requirement of HVDC converters, substations, effect of Delay angle and extinction angle on reactive power.

UNIT 6 :- I) HVDC circuit breakers :- Introduction, construction, principle, switching energy, interruption of DC current, application of MRTB, Type of HVDC C.B , capability and characteristics of HVDC circuit breakers .

ii) HVDC Substation protection against short-circuits : Introduction , fault clearing, protective zones, protection symbol, HVDC line pole protections (fault clearing and re-energising).

iii) HVDC Sub-station Protection against over-voltages Difference between insulation co-ordination of AC and DC systems. Fundamentals of switching overvoltages, O.V on A.C. sides and on DC side , surge-Arresters protection scheme, insulation co-ordination and protection margine.

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8S-EE-02(2) ENTREPRENEURSHIP DEVELOPMENT ;-

UNIT --1

Need analysis, market survey , characteristics of market , sample survey , demand forcasting , secondary data , accuracy , confidence level , uncertainty.

UNIT 2

Technical feasibility , process selection , level automation , plant capacity , acquiring technology , appropriate technology plant location , equipment selection and procurement , Govt. policies.

UNIT 3 –

Economic feasibility , cost of project , working capital analysis , fixed cost , means of finances , estimation of sales and production price analysis , break even point , projected cash flow statements, projected balance sheet , projected profile and loss statement , rate of return , discounted payback period , cost benefit analysis , return after taxes.

UNIT 4 -----
Project planning and control ,CPM, PERT, optimum project duration, resorce allocation, updating .

UNIT---5

Project report, preparation of project report, risk analysis, sensitivity analysis, methods of raising capital.

UNIT 6
Project review .
Initial review, performance analysis, ratio analysis, sickness, project revival, environmental and social aspects .

RECOMMENDED BOOKS ;----

1 . Project , prasanna chandra , Tata mc graw hill publishing com.Ltd .
2. CPM ,PERT , SHRINATH , east west publisher .
3. project , p.k .joy , mc millan .
engineering economy H.G. Thuesen, W.J. fabricky , G . J. Thuersen , Prentice hall of India pvt . Ltd s

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8SEE02(3) ADVANCE MICROPROCESSORS AND PERIPHERALS

UNIT 1 :- Introduction to 16 bit microprocessors. 8086/8088 CPU architecture, Memory organisation and interfacing, Addressing modes, Instruction Set, examples Pseudo op-codes with ASM-86.

UNIT 2 :- Interfacing of peripherals 8255 and 8253 with 8086 Architecture, operation and interfacing of 8251, 8257 with 8085 and 8086/8088.

UNIT 3 : Architecture operation and interfacing of 8259, with 8279 with 8085 and 8086/8088

UNIT 4 :- Multiprocessor system bus, 8087 coprocessor with architecture and instruction set organisation of PC XT/AT mother board.

UNIT 5 :- Introduction to 80286., 386, 486 architecture. Concepts of Cache, associated/ virtual memory, D0S structure.

UNIT 6 :- Architecture of 8097 microcontroller, its important features interface with parallel and serial I/O (Instruction set not included).

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8SEE02(4) BIOMEDICAL ENGINEERING

UNIT 1 :- Introduction :- Human body physiology and subsystems. Biochemistry Measurement of Electrical activities in human body.

UNIT 2 :- Electrocardiography, Electro-encephalography electromyography Electro-retinography Principles specifications and interpretation of records.

UNIT 3 :- Measurement of non-electrical quantity in human body. Measurement of blood flow respiration rate and depth heart rate.

UNIT 4 :- ESR blood pressure, temperature PH impedance of various parts GSR mobility of internal organs.

UNIT 5 :- Control of body functioning : stimulator for muscle and nervous system Cardiac pacemaker.

UNIT 6 :- Blood pump respiration controller myoelectric control of paralysed muscles.

8S-EE-02(5) ELECTIVE –II DIGITAL SIGNAL PROCESSING

UNIT I: - Discrete Time Signals and systems – Discrete Time Signals, Discrete time systems, Linearity, causality, stability, static/dynamic, Time invariance/Time variance, classification of discrete time systems, Linear convolution, circular convolution, cross correlation, Auto correlation.
Linear constant coefficient difference equations, sampling theorem and sampling process, reconstruction of sampling data, convolution.

UNIT II: - Frequency Domain Representation of discrete time signals and systems, Fourier Transform of discrete time signals, properties of discrete time Fourier transform.

UNIT III: - The Z-transform- definition, properties of the region of convergence for the Z-transform-transform properties, Inverse Z-transform using contour Integration, complex convolution theorem, Parseval's unilateral Z-transform, stability interpretation using jury's array.

UNIT IV: - Transform Analysis of LTI systems and structures for discrete time systems – Frequency response of LTI systems, relationship between magnitude and phase, all power systems, minimum phase system, linear system with generalized linear phase.
Block diagram representation and signal flow graph representation of linear constant coefficient difference equation, basic structures for IIR systems, transposed forms, basic network structures for FIR systems, Lattice structures.

UNIT V: - Filter Design techniques- Design of discrete time IIR filters from continuous time filters, frequency transformation of low pass IIR filters, Design of FIR filters by windowing FIR filter design by Kaiser window method, frequency sampling method

UNIT VI: - Discrete Fourier transform- discrete Fourier series, properties of discrete Fourier series, discrete Fourier transform, properties of DFT , circular convolution using discrete Fourier transform , decimation in time FFT algorithm, decimation in frequency FFT, FFT of long sequences using overlap add and overlap save method.

BOOKS: -

1) Discrete Time Signal Processing IInd Ed. Alan V. Oppenheim, Ronald W. Schafer & Buch, Pearson.
2) Digital Signal Processing – A computer-based approach. Sanjit K. Mitra.

REFERENCE: -
Digital Signal Processing Theory and Application. Proakis and Manolakis – 3rd edition PHI Ltd.

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8 S EE 02(6) Optimisation Techniques

Unit – 1 :- Introduction : Concept of Optimization, Statement of optimization problem, classification of optimization problems, optimization techniques.
Unit – 2 :- Classical Optimization Techniques: Single variable optimizations, multivariable optimization with no. equality & inequality constraints, solution using lagragian multipliers, Kunh – Tucker Conditions.
Unit – 3:- Linear Programming (Simplex method): Application of linear programming. Standard form & geometry of linear programming problems, definitions & theorems, solution of system of linear simultaneous equations, pivotal reduction of a general system of equations, simplex algorithm.
Unit – 4 :- Nonlinear programming I – One dimensional minimization methods: Introduction, unimodal functions, elimination methods, direct root methods.
Unit – 5:- Nonlinear programming II- Unconstrained optimizations techniques : Introduction s, Direct search methods, Random & grid search methods, Powell's method, Indirect search method, Canchy's method, fetcher – Reaves method, Newton's method.

Unit – 6 :- Nonlinear programming III- Constrained optimizations techniques : Introduction, characteristics of constrained problem, sequential linear programming, Zoutendijk's method of feasible directions, Rosen's gradient projection method

Reference Books :-

1) Engineering Optimization: Theory & practical (Third Edition), by S.S. Rao, New Age International

8SEE3 **SWITCH GEAR AND PROTECTION**

UNIT 1 :- General Philosophy of Protective Relaying :- Protective Zones. Primary Protection, Back up protection. Remote and Local Back Up. Selectivity.

UNIT2 :- Medium voltage Line Protection : Over-current relaying directional over-current relays

UNIT 3 :- High voltage line Protection :- Distance relays, carrier distance schemes, Unit carrier schemes.

UNIT 4 :- Equipment Protection : Principles of differential relaying, protection of generator, transformers and busbars by differential relaying and other relays. Protection of Induction Motors against over loads, short circuits, thermal relays, miniature circuit breakers.

UNIT 5 :- Introduction to static relays : Comparison of static and electro-mechanical relays, two input amplitude and phase comparators and their duality, Generation of various distance relay characteristics using above comparators.

UNIT 6 :- Switchgear :- Circuit breakers Arc interruption theory, recovery and Restrking voltage ,RRRV, breaking of inductive & capacitive currents, C. B. rating, different media of arc interruption, overview of oil circuit breakers, construction and operation of Air blast, SF6 and vacuum breakers.

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8SEE04 **COMPUTER METHOD IN POWER SYSTEM**

UNIT 1 :- Incidence and network matrices :- Graph incidence Matrices, Primitive network, formation of network matrices by singular transformations.

UNIT 2 :- Algorithm for formation of Bus Impedance and Bus Admittance matrix for system without mutual coupling.

UNIT 3 :- Three Phase Networks:- Three phase balance network elements with balanced and unbalanced excitation incidence and network matrices for three phase element Algorithm for formation of three phase bus impedance matrices without mutual coupling.

UNIT 4:- Load Flow Studies :- Power system load flow equation , solution technique : Gauss Seidal , Newton Raphson and fast decoupled technique with and without (voltage) control buses. Representation of tap changing and phase shifting transformers. Elementary load flow programmes.

UNIT 5 :- Short circuit studies : Three phase network short circuit calculations using bus impendence matrix for balanced and unbalanced faults. Computer programme for short circuit studies on simple system.

UNIT 6 :- Transient stability studies :- Modelling of synchronous machine, power system network for transient stability studies. Numerical solution of swing equation by modified Euler and Runge Kutta 4^{th} order method. Elementary computer programme for the transient stability study.

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